FEBRUARY 10, 1922

THE RUBBER AGE

VOL. X. NO. 9

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PUBLISHED ON THE 10th AND 25th OF EACH MONTH BY

THE GARDNER, MOFFAT COMPANY, Inc.

PUBLICATION OFFICE: HIGHLAND, N. Y.

ADDRESS ALL CORRESPONDENCE TO BUSINESS AND EDITORIAL ROOMS: 225 FOURTH AVENUE, NEW YORK

Telephone: Stuyvesant 4552

Advertising Forms Close Seven Days Before Date of Publication. Rates for Advertising Will Be Furnished on Application.
Subscription Price: $2.00 per Annum. Single Copies 10 Cents. Canada, $2.50 per Annum. Foreign, $3.00 per Annum.

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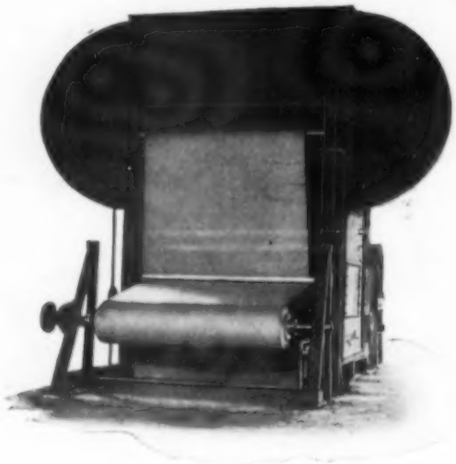

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VOL. X FEBRUARY 10, 1921 No. 9

Magnesium Carbonate as a Compounding Material

By H. W. Greider

Industrial Fellow of the Mellon Institute of Industrial Research of the University of Pittsburgh

This report presents in abstract form a consideration of the results of the experimental investigation of magnesium carbonate as a compounding material for the rubber industry. The complete research will be published later in the year.

LIGHT carbonate of magnesia is a mineral filler to which it would appear the American rubber industry has not given the extended application in the compounding art which its exceptional properties seem to merit, whereas much larger amounts of this material are used in the compounding practice of European rubber manufacturers. By reason of the fact that rubber compounding has developed along different lines in this country, particularly with respect to the adoption of gas black as a compounding ingredient, the physical properties imparted to rubber by magnesium carbonate have not been studied closely by many rubber compounding chemists. European compounders however, have not had gas black available in large quantities at a low price, as we have had for the past few years in this country, but have had light carbonate of magnesia and are, therefore, well aware of its value in many types of rubber compounds.

An extended investigation of the physical properties and aging qualities of rubber compounded with light magnesium carbonate has been undertaken by the Mellon Institute of Industrial Research of the University of Pittsburgh for the Magnesia Association of America, and the results of the investigation of this material during the past year are now available to rubber technologists who are interested in the application of this material in their products.

Light carbonate of magnesia, which is the same substance chemically as the magnesia alba used in pharmaceutical preparations, such as "milk of magnesia," is chemically a basic hydrated magnesium carbonate. Its composition has been assumed ordinarily to correspond to the chemical formula: $4\ MgCO_3\ .\ Mg(OH)_2\ .\ 5\ H_2O$, but more recent investigations have indicated that it does not have exactly this composition as manufactured by American producers, and seems to correspond more nearly in composition to such a formula as: $11\ MgCO_3\ .\ 3\ Mg\ (OH)_2\ .\ 11\ H_2O$. The raw material for the manufacture of this product is dolomite rock, of which there is an abundant supply convenient in location to the eastern markets and manufacturing centers of this country. It might also be manufactured from magnesite rock, except that the deposits of this material are mostly located on the Pacific Coast and the prohibitive freight rates prevent the hauling of the raw material for such great distances. The processes involved in the manufacture of the light carbonate are shown in graphic form on the flow sheet reproduced herewith.

Manufacture of Magnesium Carbonate

The rock, which is a mixture of magnesium carbonate and calcium carbonate, is first calcined to drive off the carbon dioxide and leave the oxides, magnesium oxide (magnesia) and calcium oxide (lime). The calcined oxides are then suspended in water and hydrated by the action of the water on the mixture of oxides The carbon dioxide which was driven off in the calcination is then returned to this suspension of the hydrated oxides under pressure. As a result of this treatment the calcium hydroxide is precipitated as calcium carbonate (chalk) and the magnesium hydroxide dissolves as magnesium acid carbonate, $Mg\ (HCO_3)_2$. The precipitate of chalk is then removed by fileration and the solution of magnesium acid carbonate remaining is heated. The results in precipitating the magnesium acid carbonate as basic magnesium carbonate, in a very bulky, finely-divided crystalline form, and the carbon dioxide is driven off from the solution. The magnesium carbonate precipitate is then removed from the liquor by filtration, is pressed, dried and carefully pulverived.

Light carbonate of magnesia will show, on samples free from hygroscopic moisture, an ignition loss (carbon dioxide and water) varying from about 54.5 to 56.8 per cent. It is very stable at ordinary temperatures, except toward the action of acids, which dissolve it, forming soluble magnesium salts. Its decomposition by heat does not begin until a temperature of 265 C. is reached, when the greater part of the combined water and small amounts of carbon dioxide will be slowly evolved. This temperature, 265°C., is considerably above that to which rubber may be safely subjected.

Magnesium carbonate is a chemical substance of which the composition varies with the method of its manufacture and with the conditions of precipitation, particularly the concentration of the magnesium acid carbonate solution and the rate of heating, but when these are rigidly controlled, the composition will be quite constant. The composition of samples of the commercial material may vary somewhat with respect to its content of calcium carbonate, but if the manufacture of the product has been properly controlled, it should ordinarily contain no more than traces of iron oxide and alumina and should not show on analysis more than a small percentage of lime as calcium carbonate.

Physical Properties

Commercial light carbonate of magnesia is a dazzling white, extremely finely-divided, inert powder. The powder is very bulky, enclosing about seven times its own volume of air and has an absolute density of only 2.18, so that it weighs, unless compressed, only about 90 grams per liter or 5.5 pounds per cubic foot. The individual particles have a distinct acidular crystalline form and in the manufacturing process the ma-

terial aggregates itself in a very bulky snowflake-like form. When the carbonate is pulverized in the manufacturing process the interlaced snowflake aggregates are practically completely dispersed and many of the individual crystals are also broken up. When the loose powder is examined it does not appear so extremely finely divided, but on rubbing between the fingers it is seen to be completely impalpable. A similar dispersion of the particles takes place in the incorporation of the carbonate by mastication on the rubber mill. Under the microscope the powder is found to consist mainly of particles having a diameter of 1 micron or smaller, with some larger crystals. The average fineness will depend upon the control of the precipitation process and upon the completeness of the pulverization, and, hence, may vary somewhat in the products of different manufacturers. Dr. W. B. Wiegand has advanced the idea that if two reinforcing pigments show approximately an equal reinforcing effect in rubber, then they must have approximately identical average particle size. Accepting this theory as representing the facts with reasonable accuracy, the experimental data obtained in the investigation of this material indicate that commercial light carbonate of magnesia has an average particle size at least as fine, and perhaps somewhat finer, than the best grades of zinc oxide.

The carbonate is nearly insoluble in water, only about 0.035 gm. of the oxide dissolving in a liter of water. It is alkaline to thymolphthalein indicator when suspended in water and this alkalinity is believed to account for its slight accelerating action in the vulcanization process.

Effect of Magnesium Carbonate on Rubber

The experimental compounding work using light magnesium carbonate has shown that, as is already well known to many rubber manufacturers, it belongs definitely in the class of compounding materials which behave as reinforcing pigments. In this group, the members of which are sometimes also designated as "active" rubber fillers, in contradistiction to those substances which only dilute the rubber and attenuate its physical properties in whatever proportion they may be used, there are included also gas black, zinc oxide, lamp black and the finer grades of prepared clay. The characteristic behavior of reinforcing pigments in general is that when used in suitable proportions they harden, stiffen and toughen the rubber in which they are used, while at the same time increasing the tensile strength and total resilient energy capacity of the rubber. While each filler exhibits its own special physical characteristics in the rubber with which it is compounded, the degree of reinforcement is generally believed to be directly related to the fineness of division of the particles of the material, i.e., the reinforcing effect is a function of the amount of surface area exposed to the rubber by a unit volume of the pigment, this unit volume being expressed in terms of the absolute density of the substance and not in terms of its apparent bulk.

Magnesium carbonate has a very pronounced stiffening and toughening effect upon rubber and when used in suitable proportions it also considerably increases the tensile strength. In rubber cured with 5.0 per cent. sulfur and containing a considerable excess of litharge as accelerator, to give a flat state of cure curve over a vulcanization period of 40 to 50 minutes at 42 pounds steam pressure (143°C.), the maximum reinforcing effect was given by 9 volumes of magnesium carbonate to 100 volumes of rubber, which corresponds to about 21 parts by weight to 100 parts rubber. A 45-minute cure was found to give the optimum properties to the stocks vulcanized under the above conditions, both with respect to tensile strength and aging qualities. With a pale crepe rubber basic mix having a tensile strength of 2575 pounds per square inch, the addition of 9 volumes of magnesium carbonate increased the tensile strength to 3000 pounds per square inch. The ultimate elongation was decreased by the same addition of magnesium carbonate from 700 per cent. to 655 per cent., giving a rubber which was appreciably stiffer and less resilient, as well as harder. The "tensile product" was increased from 205 to 227, but the experimental evidence appears to show that while the "tensile product" may be a satisfactory means of evaluating rubber containing only coarse fillers, it does not give a satisfactory index of the mechanical quality of rubber containing any appreciable proportion of reinforcing pigments, such as magnesium carbonate. It appears that the real significance of the reinforcing effects is more accurately shown by the application of the concept and method of W. B. Wiegand to the study of total resilient energy capacity. Wiegand, in the development of this theory, relates resilient energy capacity to the ability of the compounded rubber to resist abrasive wear.

The basic mix described above shows total resilient energy capacity of 318 foot-pounds per cubic inch of the compounded rubber while a stock containing 9 volumes of magnesium carbonate shows 475 foot pounds energy capacity, or an increase of 49 per cent. The stress strain curve for rubber so compounded is fairly flat over the greater portion of its length and does not exhibit the high extensibility of the basic mix for the application of small stresses, in the lower portion of the curve. The behavior of rubber compounded with magnesium carbonate approaches accord with Hook's law, that is, the stress is nearly proportional to the strain or deformation, more particularly when larger proportions of the filler are used. Since the total energy of resilience is derived from the area between the stress-strain curve and the elongation axis, it is not difficult to understand why rubber compounded with moderate proportions of magnesium carbonate shows high resilient energy capacity, because the stock has high tensile strength, high ultimate elongation and a reasonably flat stress-strain curve, hence, the area included in the projection of this curve upon the elongation axis is large. The energy capacity of the rubber is, of course, not the only factor determining its ability to resist abrasive wear, but it can hardly be doubted that high resilient energy is a valuable property in many technical rubber products and in this respect, therefore, magnesium carbonate may reasonably be expected to have a definitely beneficial effect upon compounded rubber.

In rubber compounded with magnesium carbonate the tensile strength does not ordinarily become less than that of the basic mix until 20 volumes of the filler have been added per 100 volumes of rubber, which corresponds to about 46 parts by weight to 100 of rubber, and some samples have been prepared containing 25 volumes of magnesium carbonate in which the tensile strength was approximately equal to that of the basic mix. When still greater amounts of this filler are added the rubber falls off in tensile properties quite uniformly with increasing amounts of magnesium carbonate and the rubber becomes very stiff. The "tensile product" falls below that of the basic mix when 15 volumes of the magnesium carbonate have been added, which is readily explained by the great stiffening effect of this filler. The resilient energy capacity, however, which is regarded by Wiegand as an index of resistance to abrasive wear, does not become less than that of the basic mix until more than 25 volumes of magnesium carbonate have been used.

Cannot be Used as White Pigment

Although magnesium carbonate is a powder which exhibits an intense whiteness, it has practically no covering power in rubber and cannot, therefore, be used as a white pigment to make a white product. This is, however, not a serious disadvantage, since, when the reinforcing effect of magnesium carbonate is desired, a white color may very easily be produced by the addition to the compound of suitable quantities of some other white pigment, such as lithopone, barytes or zinc oxide. The reason for the lack of covering power of magnesium carbonate is that its index of refraction is very close to that of the rubber in which it is incorporated. The very interesting observation has been made that rubber compounded with 20 volumes of magnesium carbonate and cured with sulfur only, without litharge or other accelerators, is nearly as translucent, until made opaque by "blooming," as rubber containing no filler whatever. This property of the pigment may be made use of in preparing colored rubber articles, where a reinforcing filler is required and it is desired to use one which will not mask the pigment used for coloring, making necessary the use of a larger amount of an expensive color. Due to the fact that magnesium carbonate has itself a very low density, 2.18, rubber compounded with this filler will have a low specific gravity.

In many rubber products, particularly those intended for personal use, such as drug sundries, boots, shoe soles and heels, this is a desirable property, especially when the rubber so compounded also has high tensile properties, resilience and resistance to wear.

The advisibility of using light magnesium carbonate as an ingredient of any particular type of rubber compound will, of course, need to be determined by experiment after a study of the fundamental properties imparted to rubber by this filler. The use of the material as a compounding ingredient has two limitations. The first is that, since the maximum reinforcing effect both with respect to tensile strength and resilient energy is given by the addition of only 21 parts by weight of the filler to 100 parts of rubber, it will not be most economical to use this filler for its reinforcing effect in greater proportions than that, unless it is especially desired to prepare a very stiff rubber. Unless the price of rubber becomes again very much higher than that now prevailing, magnesium carbonate would hardly be used as a diluent to cheapen the product, especially when there are many other less expensive materials, such as clay, barytes, fossil flour and precipitated chalk, which will serve that purpose equally well without producing any reinforcing effect.

Imparts a High Permanent Set

The second limitation of the use of magnesium caarbonate lies in the fact that this material inparts high permanent set to rubber. This quality seems to be intimately related to the fact that the magnesium carbonate particles are quite definitely crystalline in character. When the permanent set test is carried out according to the method recommended by the Physical Testing Committee, Rubber Division of the American Chemical Society, it is found that 9 volumes of the filler will produce a permanent set in the rubber of 23.0 per cent., while if 20 volumes of the filler are used, the set which results is 30.0 per cent. This high permanent set effect is ord narily explained by assuming that when the compounded rubber is placed under stress the crystals of magnesium carbonate shift their positions and readjust themselves in the rubber, due to the poor bonding between the crystal faces and the rubber matrix, so that when the stress is removed the new orientation of the particles prevents the rubber returning to its original length and conformation. With larger proportions of filler there may be an actual interlocking of the crystals which operates to produce the permanent set observed.

The property of imparting high permanent set, is, of course, a disadvantage in some types of rubber compounds, but it operates to limit the proportion of magnesium carbonate which may be advantageously used, rather than to prohibit its use altogether. The extremely interesting possibility presents itself that the crystalline character of magnesium carbonate may perhaps be modified by the introduction of certain changes in the precipitation process, resulting in obtaining a material of less pronounced crystalline character and perhaps also in a finer state of division, in which case it is reasonable to believe that the reinforcing effect in rubber would be considerably enhanced and the permanent set reduced at the same time.

Results of the Study of Vulcanized Compounds

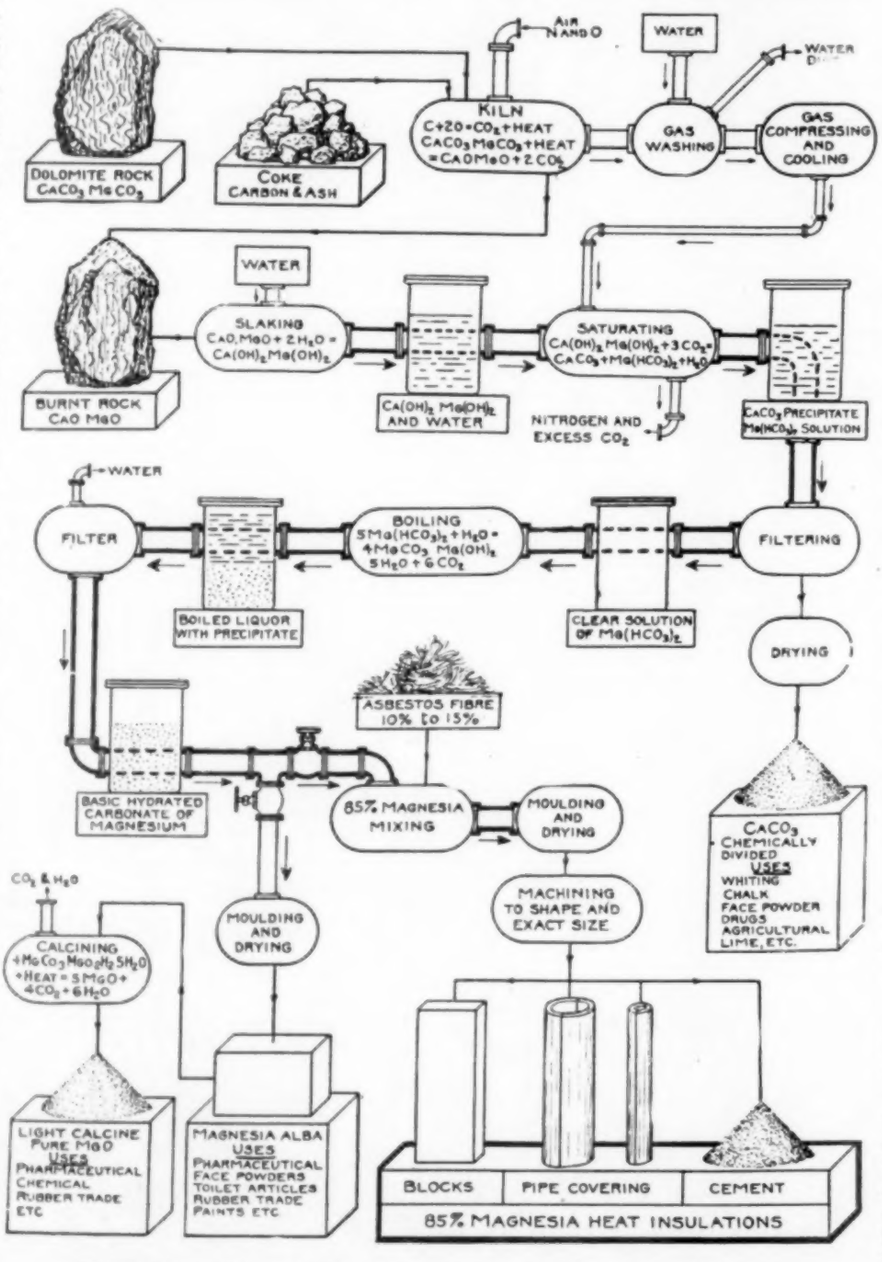
Some extremely interesting and significant results have been obtained in the study of the physical properties of vulcanized compounds containing mixtures of reinforcing pigments such as magnesium carbonate, zinc oxide and gas black in the basic mix previously described. An experimental study of

A Dolomite Rock Quarry. Dolomite is the Commercial Source of Magnesia

rubber stocks compounded with mixtures of zinc oxide and magnesium carbonate, each stock containing a total of 20 volumes filler, for the purpose of comparing the effects of these two fillers, has shown that magnesium carbonate gives tensile strength and resilient energy capacity equal to that obtained by the use of an equal volume of zinc oxide, while mixtures of these two fillers give slightly higher values for these properties than when either material is used alone. The magnesium carbonate stock and the stocks containing the larger proportions of this filler in mixtures with zinc oxide are quite appreciably stiffer and harder than the stock containing zinc oxide alone. With respect to the stiffening effect, therefore, magnesium carbonate has a greater reinforcing effect in rubber than does zinc oxide. The very important observation was also made, that, although the stock containing only zinc oxide showed a permanent set value of 12.0 per cent and the magnesium carbonate stock showed 28.5 per cent set, the value for the property of the rubber did not rise above 17.0 per cent until half the zinc oxide in the compound had been replaced by magnesium carbonate.

Investigation of the aging qualities of rubber compounded with magnesium carbonate and with mixtures of magnesium carbonate and zinc oxide showed that with respect to aging qualities this filler compares favorably with others. Under the accelerated aging test, heating 7 days at 70 deg. C. in a slow current of air, the zinc oxide stocks and magnesium carbonate stocks aged almost exactly the same. Under the effect of weathering for 60 days, exposed to the sun, during the summer and unprotected from the atmosphere (a very severe test), the samples which were heavily compounded with magnesium carbonate developed a certain amount of visible surface checking, so that the tensile values fell off somewhat more than was the case with zinc oxide. With the samples containing less than 15 volumes magnesium carbonate, however, this surface cracking was not in evidence and the samples did not lose a greater part of their tensile strength than was found to be the case with similar samples compounded with zinc oxide. The aging qualities of the samples compounded with mixtures of zinc oxide and magnesium carbonate were satisfactory, even under this severe test, especially when not over one-third of the zinc oxide was replaced by the carbonate.

A similar comparison of the physical properties imparted to rubber in the same litharge-crepe rubber basic mixing has been made between magnesium carbonate and gas black, having 25 volumes total filler in each compound, in which case it was found that the values obtained for tensile strength were approximately the same for these two fillers. The gas black, however, gave a very much stiffer and less resilient rubber than the magnesium carbonate, in this litharge—pale crepe rubber basic mix. With smoked sheet or fine para rubber an entirely different stress-strain curve may be obtained and the relation between the reinforcing effects obtained with these two fillers may be somewhat different, which may also be the case when organic accelerators are used in the curing process instead of litharge. For example the stress-strain curve for fine para rubber containing 20 volumes of gas black, is found to be entirely different from that volume of gas given by the same black in a pale crepe basic mix, with respect to tensile strength, ultimate elongation and resilient energy capacity, all these values being considerably greater for the para compounded. The same sort of differences will, of course, be exhibited by magnesium carbonate, zinc oxide and other reinforcing pigments, when compounded in different types of rubber.



FLOW CHART ILLUSTRATING MANUFACTURE OF 85 PER CENT MAGNESIA

Because it had been found that the maximum reinforcing effect was produced by 9 volumes magnesium carbonate per 100 of rubber, comparison was made with equal volumes of zinc oxide and gas black and with mixtures of these three pigments in the same basic mix, the total filler in each compound being 9 volumes. It was found that carbon black gave the highest tensiles, magnesium carbonate next and zinc oxide

next. The resilient energy capacities were in the same order. The most significant effect observed in the case of mixtures of these three fillers was that the highest tensile value, 3200 pounds per square inch, and the greatest resilient energy capacity, 540 faat pounds, an increase of 66 per cent over the basic mix, was given by a mixture of 6 volumes gas black and 3 volumes magnesium carbonate.

At present prevailing prices magnesium carbonate compares favorably as a compounding ingredient, on the basis of the cost per unit of reinforcing effect.

In the light of this knowledge of the valuable properties imparted to rubber by magnesium carbonate, as indicated in the above outline of the experimental investigation, it seems evident that further study of this material will surely enable the American rubber industry to find a more extended application for it in its compounding practice.

Possibilities of Rubber Latex in Paper Manufacture

By Wade Blackard

American Vice Consul, Singapore, Straits Settlements

IN view of the continued depression in the rubber market, the present low price of rubber which is approximately one-third of the price in 1920, the claims that rubber latex is a material for paper making are interesting to rubber growers. Experiments have been conducted by Frederick Kaye, A.R.C.S., and he has patented his process. If this process is adopted the manufacturers of paper will give a great stimulus to two industries, the plantation industry will have an entirely new use found for the product of its fertile rubber trees, and a demand will be set up for large supplies of rubber latex, so that the output of rubber in this form should eventually rival that of the shipments of coagulated and sheeted rubber as used in ordinary manufacturing processes.

It will not be a difficult matter with the present scientific staff in the East to standardize the methods of preservation, packing and despatch of the latex to all paper making countries. This new process should appeal to the manufacturers of paper particularly on account of the fact that it will greatly cheapen the cost of production and in addition to this it is claimed that the qualities of paper made from the rubber latex will be greatly improved. The preparation of rubber latex for paper making will not be nearly so difficult, as the preparation of pulp, nor will it take so long a time. And it is further claimed that the increase in strength of paper made from rubber latex will allow quicker speed of production on the paper making machine.

Naturally, if the paper made from rubber latex is produced cheaper and in greater quantities than at present, the cost of other articles will be beneficially effected. Books, for example, can be produced cheaper because of the greater durability and very high folding number of thick paper and boards made from various fibres, but containing rubber latex, and it will give splendid material for book-binding. This material can be dyed in the beater. It has a greatly improved texture, pleasant to the touch and to handle generally. It is generally acknowledged by paper makers that remade paper is weaker than paper made from fresh material, and that each time the stuff is remade, the quality goes down. In comparison, it is claimed that the use of rubber latex in the remade material will give out many qualities much superior to paper made from fresh fibres by the ordinary paper making processes. It is thought, too, that by the application of rubber latex to paper making processes, new kinds of goods will be produced in paper mills to take the place of animal leather, carpets, linoleum, and even textile fabrics. If this proves the case there should be a big demand for rubber latex with the natural increase in rubber producing and the general benefit to the entire rubber trade.

Mr. Kaye claims in his process that the effect of some fibres upon the quality of the paper produced containing small quantities of rubber even very much less than 1 per cent upon the weight of dried paper, is to put the rubber paper a great deal higher in physical qualities than that of paper made from the same fibres by the usual processes. Experiments were made to show that with an ordinary fibre made into a paper containing 0.1 per cent, (one-tenth of one per cent) of rubber, the product had a folding number of 5,000 to 6,000 and a tensile strength two to three times that of the same material made without rubber. But with a rubber content of about 0.75 per cent the folding number reached 14,500, while the same fibre made in the usual manner had a folding number of 30.

Another fibre beaten for half the usual time made into a paper containing one per cent of rubber had a folding number of 72,500, and a tensile strength of 81 pounds for a strip one inch wide, equal to 5,600 pounds per square inch or about twice the strength of a well vulcanized rubber compound, such as is used in motor tires, etc. The bursting strength was over 40 pounds for a thickness of one-tenth of a millimeter. The above are examples of rubber latex paper without any after-vulcanization.

It is possible that vulcanization will not be necessary for the rubber latex paper though it is probable that certain classes of goods may contain large quantities of rubber and after-vulcanization might be an advantage. It has been found that the latex can be so treated that a sort of self-vulcanization will be brought about in the paper, the strength of the rubber paper increasing gradually as time goes on. In conjunction with this experiment the recent tests as to the effect of small quantities of moisture in retarding the deterioration of rubber are interesting. For the small quantity of moisture which is natural in paper may be a very material help in the preservation of the qualities that rubber paper possesses.

If this process of paper making from rubber latex proves to be a commercial success then rubber trade in the East may certainly expect a big increase in the demand for crude rubber. In the United States alone, the high price of paper and the constantly diminishing supplies of pulp-wood have made the future production of paper in large quantities an acute question. If paper can be made from rubber latex cheaper with more durable qualities and a more pleasing appearance, then instead of negotiating with Canada for pulp-wood, we will find the large paper buyers and paper mills of the United States placing their orders for paper material with the rubber growers of the Straits Settlements and the Federated Malay States, which produce the greater part of the world's rubber supply.

Recovering Vulcanized Rubber Waste

The principle of the process is based on the fixation of the sulphur released from the vulcanized rubber during the treatment by the use of an aqueous solution suitable materials which will combine therewith or be dissolved therein. Both high temperature and pressure are employed. The action takes place in the presence of 5 per cent of an aromatic amine.

Acceleration of Vulcanization

This process depends upon the use of a double accelerator which is not by any means a new development. Paranitrosodimethyl aniline is used as the accelerator or homologues of the same and likewise an aromatic base or substance which can form it during the process of vulcanization. (see German Patent No. 325,306.)

The Rubber Division of the Bureau of Foreign and Domestic Commerce

By P. L. Palmerton, Chief

THE purpose back of the organization and operation of the Rubber Division of the Bureau of Foreign and Domestic Commerce is to place before the rubber goods exporters of the United States the facilities of the Bureau in order that they may receive the benefit of the Government's cooperation. Under the direct supervision of specialists brought from the industry into the Bureau, it is proposed to use every facility of the Department of Commerce for the greatest possible advantage of interested companies, and, in addition to organizing new facilities and directing the old, to improve the service as time passes.

Contact with the Industry

It has been said that the Bureau has been handicapped in doing the greatest good for American business through lack of sympathetic contact with the many industries it was trying to aid. This contact will, in truth, furnish the general guidance for the Bureau's efforts. Accordingly, the Rubber Division has, through its period of organization, made but slight announcement of its plans. It was felt that whatever plans were made should be subject to the approval and amendment of the industry. Accompanied by a questionnaire, a tentative program was recently submitted to 600 rubber companies of the United States, and it is from their returning comment, as well as personal contact in some cases, that the plans for the division have been evolved. The foreign trade interest of the rubber industry is well centered in the Rubber Association of America (Inc.), with which the Rubber Division closely cooperates. The chief of the division has been made an ex officio member of the executive committee of the foreign trade division of the association and will accordingly attend all their meetings in the future as in the past, where will be gathered first-hand information on problems and needs of the association.

Character of Information Supplied

The Bureau of Foreign and Domestic Commerce has always been largely an informational agency to American companies interested in foreign markets. It has in a measure been the research department for the exporting business of the United States, because such work is really the basis of foreign trade development. Accordingly, the Rubber Division holds its most important function to be that of supplying authoritative trade information to the United States companies who desire to export rubber products. The source for much of this infomational service is the investigations and reports of the foreign representatives of the Government, including commercial attachés, trade commissioners, and consular officers.

The informational files of the Rubber Division, which are always at the command of the rubber companies of the United States, are grouped under a territorial classification into five main parts for each country, as follows:

Informational Files

Importation of rubber goods.—Import statistics, showing sources; customs duties levied; local manufacturers; foreign competitors in the trade; general observations.

Tire and tube market.—Import statistics on casings, tubes, and solid tires, showing sources; automotive population (passenger cars, motor trucks, motor cycles); rate of car importations; types of tire equipment used; competitive makes of tires offered; road conditions; automobile and tire importers; tire repair material market; general observations.

Mechanical rubber goods market.—Import statistics on belting, hose, and packing, etc., showing sources; agricultural activities and equipment; manufacturing activities and equipment; mining activities and equipment; railway mileage and equipment; other industrial activities; mechanical rubber goods importers; general observations.

Rubber clothing and footwear market.—Import statistics on rubber footwear, rain clothing, and soles and heels, showing sources; climatic conditions; purchasing power and habits of inhabitants; importers of footwear and clothing.

Rubber sundries and specialties market.—Import statistics on rubber sundries and other items, showing sources; purchasing habits of the inhabitants; importers of sundries and specialties; general observations.

The impression must not be given that the files are complete in all the parts indicated. Information on these subjects that has heretofore come in has been more or less irregular. Whatever is available has been put in order and carefully checked for accuracy and completeness. The next step is to secure from the department or consular representatives abroad the necessary information to supplement that already on hand.

Getting Information to the Trade

The Rubber Division disseminates the information which it collects and prepares through various media, such as *Commerce Reports,* confidential circulars mailed direct to companies on the exporters' index, newspapers and trade journals, correspondence in answer to specific inquiries, personal contact between the division and the trades, and loose-leaf manuals.

In connection with receiving the confidential circulars just mentioned, the importance of American rubber companies enrolling themselves in the Bureau's exporters' index should be stressed, since only through enrollment can they be assured receipt of such confidential reports or actual trade opportunities. No charge is made for this service, but it is reserved for American firms only. The delivery of reports and opportunities without special requests has already started, and is finding favor among the rubber-goods exporters. Specific inquiries from the trade are solicited and will be answered promptly and carefully.

The loose-leaf manual is expected to become a valuable part of the division's service. The manual will be prepared and distributed in sections, each of which will deal with a particular foreign market. The information contained therein will be in the same order as shown above for the division's filing system, and in fact will be a condensation of the information in the files. Being in loose-leaf form, the different sections will be ready to receive corrective or supplemental sheets at any time, such sheets to be furnished by the division either periodically or as they become necessary.

Other Sources of Information

Information on rubber-goods markets will not be drawn altogether from the foreign representatives of the Commerce and State Departments. Many foreign countries offer rubber-trade journals that are worthy of careful reading, since they deal intimately with their local or near-by markets. Automotive journals will also be used to supplement the rubber-trade journal list. The official publications of various countries will be studied for import and export statistics that refer to rubber products, because they are found valuable as market guides. Lastly, special foreign investigations will be undertaken by a representative of the division. The markets receiving this special attention will be important ones, and their selection will be made with the advice of the trade.

Other Governmental Help

As the representative of the rubber industry in the Department of Commerce, the Rubber Division will aid the exporters of that industry in establishing and maintaining

contact with other governmental agencies. Prominent among these are certain technical divisions of the Bureau of Foreign and Domestic Commerce that offer very helpful services but which are pleased to have the cooperation of the appropriate commodity specialists. The Divisions of Commercial Laws, Foreign Tariffs, Commercial Intelligence, Statistics, and Transportation are equipped to give aid to exporters on definite problems. Each of these divisions is cooperating with the Rubber Division in the preparation of the monographs which the last-named division will issue. The Division of Commercial Laws stands ready to aid United States exporters in any legal aspects of their foreign trade. The Commercial Intelligence Division is able to supply names and information about importers in all countries, and the other divisions named offer valuable services well indicated by their names. In discussing problems or questions with any of these divisions the Rubber Division will try to lend to the discussion the rubber goods exporters' view-point. When any question or problem presented to the Rubber Division calls for the attention of any of the divisions named, the proper contact will be established immediately for the exporter. The division will also work in connection with other governmental agencies in seeing that the interests of the United States rubber industry are protected in all markets where discrimination is proposed.

Competition in Foreign Workers

In addition to its other activities the Rubber Division will concern itself with specific problems of the industry. The present competitive situation makes desirable the collection of comparative price reports on certain rubber items from prominent markets and the work will accordingly be undertaken.

The activities and methods of foreign competitors in the trade will be closely examined, largely through special investigations by a trade commissioner from the division or by general representatives of the Department of Commerce.

The opposition to the straight-side tire in certain markets makes it necessary to explain the real advantages of that type of tire. There is an insistent call for crude -rubber statistics, and a better system of collecting such statistics will be needed.

The activities of the division will depend in the final analysis upon the demands made upon it. Whatever its service, the basis for it will be accurate trade information, and the facilities of the Bureau are accordingly being lined up to provide that foundation. The guidance will come from the trade, amending and supplementing the tentative plans as stated herein. All suggestions and questions are welcome, whether they concern the work of the Rubber Division as a whole or just the individual business of the inquirer.

Rubber Proves Best Cold Storage Packing

According to special London correspondence of the Philadelphia *Public Ledger* what is claimed to be an absolutely new use for rubber as a non-conductor of heat for cold storage chambers has been discovered in the National Physical Laboratory.

The problem which the laboratory considered was to find a form of packing that would further increase the heat resisting qualities of the ordinary vacuum chamber. Insulation, with concrete blocks, pitch pine, fiber from the eucalyptus tree, bricks made of paper, packing taken from a warship after fourteen years' service, cork plaster and special earth deposits were among the materials tested.

The most successful results, however, were obtained with rubber expanded by gas into a highly cellular form. It was found that by packing the cold chamber with this material the amount of heat that got through from the outside was lower than in the case of cork or any other substance studied in the course of the investigation.

Only one and a half times the amount of heat passed through the rubber over that which would have been the case had the insulator been a perfect vacuum—a condition impossible of attainment—while the weight of the cellular rubber is only about one-half of an equal amount of slab cork. The expanded rubber is prepared by vulcanization under gaseous pressure amounting to as much as 100 atmospheres.

Insulated Wire and Cable Standardization

Insulated wires and cables constitute the biggest single item of manufactured electrical devices and machinery, their value being about 17 per cent of the total value of all such equipment.

Many engineering societies and commercial organizations have issued standard specifications for them which have come into very general use. Indeed, at the present time there are something like fifteen such specifications in wide use in the United States.

All of these specifications, however, are made to apply to specific industrial uses and little has been done to coordinate them. It has, therefore, become a matter of concern to both manufacturers and users of wire to bring about some coordination, with the idea of establishing a definite set of American Standards.

The first step toward this was taken last winter when the following ten engineering societies and other public organizations agreed to act as Sponsors, under the auspices of the American Engineering Standards Committee, for a comprehensive standardization of electric wires and cables for other than telephone and telegraph use:

American Electric Railway Association, American Institute of Electrical Engineers, American Railway Engineering Association, American Society for Testing Materials, Associated Manufacturers of Electrical Supplies, Association of Edison Illuminating Companies, Association of Railway Electrical Engineers, National Board of Fire Underwriters, National Electric Light Association, National Fire Protection Association.

These organizations enlisted the cooperation of several others, and created a comprehensive group of committees to handle the work. The other cooperating organizations are:

Associated Bell Telephone Companies, Electric Power Club, Society of Automotive Engineers, U. S. Dept. of Commerce, U. S. Dept. of Navy, U. S. Dept. of War.

The first meeting of the Sectional Committee was held at the headquarters of the American Society of Mechanical Engineers on Friday, December 6, 1921. At this meeting, a formal plan of organizations and procedure were adopted, officers elected, and the work definitely launched.

There are twelve technical committees to which specific phases of the work have been assigned. Like the Sectional Committee itself they are organized under the representation plan; that is, they are made up of representatives designated by the various organizations concerned in the particular subject with which each committee deals. These committees with their chairman are as follows:

Definitions, W. A. Del Mar; Copper Conductors, J. A. Capp; Stranding, H. A. Morss; Rubber Insulation, F. M. Farmer; Impregnated Paper Insulation, D. W. Roper; Varnished Cloth Insulation, L. L. Elden; Magnet Wire, R. W. Longley; Fibrous Coverings, C. B. Martin; Metallic Coverings, W. I. Middleton; Standard Make Ups, C. A. Greenidge; Export, W. S. Clark; Weatherproof, Heat Resisting and Similar Materials.

The officers of the Sectional Committee and other members of the executive committee are: chairman, W. A. Del Mar, Chief Engineer, Habirshaw Electric Cable Co.; vice chairman, E. B. Meyer, Asst. Chief Engineer, Public Service Electric Co. of New Jersey; secretary, F. J. White, Eelectrical Engineer, Okonite Company, 501 Fifth Avenue, New York; F. M. Farmen, Chief Engineer, Electrical Testing Laboratories; Dean Harvey, Engineer in Charge of Materials Section, Westinghouse Elec. & Mfg. Co.; E. B. Katte, Chief Engineer, Electric Traction, New York Central Railroad Co.; Dana Pierce, National Board of Fire Underwriters.

The task before this Sectional Committee is one of the largest yet undertaken under the ausipees of the American Engineering Standards Committee. The total number of engineers participating in the work is over one hundred and thirty, and the list includes most of the men who have achieved distinction in the field of wire and cable engineering.

According to German Patent No. 307,173 textile fabrics are impregnated with rubber by subjecting them either before or after vulcanization to a pressure of several atmospheres at temperatures varying from 30 to 50 degrees.

ABSTRACTS

Technical — General — Commercial

Compounding Rubber with Glue

Since the development of accelerators, the need of obtaining a homogeneous mixture of rubber and the various compounding ingredients has become more emphasized, due to the rapidity of the vulcanization process. If the mixture is not well made, then the quality of the rubber produced therefrom on vulcanization is not of the highest for in some parts of the article the rubber may not have been vulcanized to the proper degree. Therefore, any new process which undertakes the admixture of new fillers and other ingredients with rubber, must take this fact into consideration and make provisions for securing the necessary homogeneity in the mixture.

The process in question (see United States Patent No. 1,400,231) is concerned with the obtaining of a homogeneous mixture of glue and rubber. In former processes the glue was first reduced to the plastic state, while in this process it is used in the condition as taken from the barrel, that is, air dried glue can be used as such. The operation takes place at a relatively high temperature, above that of the boiling point of water and the mixing is continued at this controlled temperature for such a length of time as to give the desired results without injurying the product in any way. The heat causes the plasticization of the glue in conjunction with the rubber itself and the former is disseminated uniformly throughout the rubber mass. Another feature of the process is that the water present in the batch is volatilized at the temperature of the operation, so that the rubber mixture can be vulcanized after the addition of the suitable vulcanizing agents without the necessity of preliminary drying.

A mixer of the Werner Pfleiderer type is used and there are placed therein about 70 parts of rubber and 27.5 parts of air dried glue. The mixture is kneaded in the mixer and as a result of the very vigorous tearing and kneading action that goes on therein, the temperature rises and in a very short time it reaches a point above the boiling temperature of water. As the temperature continues to rise, cooling water must be circulated through the mixer so as to keep the temperature below 300 degrees F. When the mixing is completed, the mass is dumped out and allowed to expand whereupon the volatilized water escapes. The vulcanizing agents can now be added directly to this mass.

Time and temperature are the controlling factors in the process and these vary according to the nature of the rubber treated. Both animal and vegetable glue can be used in the process. The glue may contain more water than is present in the air-dried glue and also less, but not so little that the glue will not plasticize in the mixer.

Treating Rubber in the "Tubing Machine"

In the manufacture of rubber treads for tires, the rubber is squeezed through a "tubing machine" and the strip of rubber is given a determined stretch and then cut into the desired lengths and cooled by immersion in cold water. The latter treatment as well as the relieving of the stresses in the rubber causes a certain shrinkage to take place in the rubber strip. It is very difficult to predetermine the amount of this shrinkage accurately, with the result that in making allowance for it it is always underestimated purposely which means that the strip must be cut again to the exact length and the rubber cutting is consequently lost.

The Firestone Tire & Rubber Co. have been assigned United States Patent No. 1,400,137, which has for its main purpose the overcoming of this loss. This is accomplished by placing a certain predetermined amount of compression in the rubber stock as it issues from the tubing machine and before it is cut to length. In this manner an accurate cutting is obtained without any loss of rubber as explained above and without the necessity of recutting the rubber after the strip has set. The apparatus with the aid of which this operation is effected is regulated in such a manner that different degrees of compression are given to different characters of rubber stock according to the shrinkage coefficient of the same. The compression effect is produced by a differential speed between the two conveying and supporting belts in the apparatus.

Cotton Situation in Egypt

Cotton has fallen in price in Egypt to such an extent that the Government has ordered the restriction as to future planting, which amount to a two-thirds cut in the 1920-1921 season, to be extended to the 1921-1922 and 1922-1923 seasons. The exportations of cotton to the United States from Egypt were 886,000 cantars in 1919-1920, compared with 101,000 cantars in 1920-1921. (A cantar is equal to 45 kilograms or about 100 pounds). The Government is also encouraging the planters to form cooperative associations. A syndicate has also been formed with the object of withdrawing from the market and storing about 200,000,000 pounds of cotton until a better price can be obtained for it.

Incorporating Fibers with Rubber

French Patent No. 518,848 is concerned with a process of causing various animal, vegetable and mineral fibers to be incorporated properly with rubber. Due to the colloidal nature of the product, rubber does not impregnate the fiber very well and consequently they must first be treated with an amorphous substance which will both impregnate the rubber properly and form a fast combination with the rubber itself. such a substance has been found in the product that is obtained when sulphur and oil of turpentine are heated together at 140 degrees C. When the heating is completed, the fiber is impregnated with the hot solution and then the rubber solution is applied in the usual manner.

Rubber Films

P. Schridrowitz, in British Patent No. 166,731, has patented a process of making rubber films by making the rubber latex alkaline, and then mixing it at a temperature of 70 degrees C with a solution of glue or other similar colloidal substances. When the solution is evaporated, films are formed which only on one side are rubber, while on the other side they are constituted of glue. It is impossible to separate one film from the other by mechanical means. Leather, to which rubber does not adhere very well, can be coated with rubber by the interposition of the layer of glue, formed as described above.

Vulcanized Articles from Textile Fibers and Paper

Turpentine is heated with sulphur in a vessel, provided with a reflux condenser. The temperature is kept at 140 degrees C. In this manner a solid black mass is obtained which is soluble in turpentine, toluol, xylol and insoluble in water, while partly soluble in acetone. The substance is amorphous and posesses a conchoidal fracture, but it is not colloidal. Various textile fibers, paper, etc. are steeped into this molten mass and then rubber is added and the entire mass is vulcanized.

Regenerating Used Rubber

Various sorts of rubber refuse and waste are treated with water in the presence of an alkali. The solution used must be hot. The process is conducted in an autoclave wherein the pressure may be raised from 200 to 600 atmospheres. It is claimed that the use of high pressures and high temperature gives very desirable results. For further details the reader is referred to the original patent. (German Patent No. 313,554.)

The Colloid Mill and the Rubber Industry

By Ismar Ginsberg, B.Sc., Chem. Eng.

For the past six months foreign literature, the literature of England, France and Germany, has been replete with numerous references to a machine, invented in Germany by Hermann Plauson and manufactured by the world-known German machinery house, Emil Passburg of Berlin. This machine is called the "Colloid Mill" and is intended to reduce any and all materials to the state of a colloidal dispersion by mechanical means. The claims made for this important invention have been very great indeed. Practically no important branch of chemical industry has been overlooked in extending the application of the colloid mill. It appears that experiments have been conducted by the inventor along most diversified lines with uniform universal success. Basing their action probably on the adage that "where there is a lot of smoke, there is always sure to be some fire," certain interests in this country, so it is understood, have acquired the American rights to the machine and are checking up the various claims made for it by careful experimentation. Before long it is hoped that these results will be published.

The colloid mill has tremendous significance for the rubber maker. If the machine is actually practical and will do the work, it is likely to revolutionize the rubber industry. The German rubber industry has apparently taken the matter up seriously, and recently the well-known German rubber technologist, Dr. Ditmar, carried out some important experiments with the colloid mill. French chemists have been following up the matter closely and correctly state that the claims are neither to be rejected in their entirety as impossible, nor are they to be accepted with too much credulity in the practicality of the machine. But, the matter certainly deserves our attention and the possibility of its eventually assuming even a part of the significance claimed for it as far as the rubber industry is concerned warrants our spending a little time in describing the machine and what, it is said, it can do for the rubber manufacturer.

Rubber is perhaps the most important of the industrial colloids. It belongs to that class of substances which are colloidal by nature, in contradistinction to another class which is non-colloidal naturally but which can be converted into the colloidal state by various methods. Other members of the first class are various resins, gelatine and glue, agar-agar and various other natural and artificial substances. The second class includes a large number of substances, among which there are many that are used in the compounding and vulcanization of rubber, such as sulphur, oxide of zinc, graphite and other pigments, chalk, etc. Generally each substance can exist in both the solid and liquid condition as a colloid. Rubber latex from the tree represents the liquid condition of the colloid, or as it is called the colloid sol, and the crude rubber, as it comes into the rubber mill, produced by the coagulation of the latex, is the solid or gel state of the colloid. In the rubber factory a colloid gel is being worked with and it will be evident to all at the very start that different results would naturally be obtained when compounding with the rubber gel fillers and vulcanizing agents in the colloidal condition.

The machine called the colloid mill is merely a grinding apparatus for disintegrating the solid substance in the liquid medium, usually water. The mill is made in two forms, the impact and the friction type. The principle on which the mill works is very simple. The regular type of pulverizers grind the material suspended in air. These mills work very nicely up to a fineness of about a hundredth of millimeter, but beyond that they will not grind. The reason assigned for this is that the air forms a cushion between the fine particles and absorbs the shock received by the solid matter from the teeth of the grinder. This degree of fineness is really very high but it falls far short of the fineness of a colloid which is about one hundredth of a Mu or one hundred thousandth of a millimeter.

Up to the present time colloidal solutions were made by different chemical and electrochemical methods, but these processes are not applicable to large scale production and moreover they are very expensive and can be used only in making various colloidal drugs, such as colloidal mercury, silver, iron, etc., which are consumed in small quantities only and whose effects are so remarkable in the treatment of disease that any price within reason can be obtained for them. The conversion of matter into the colloidal state by mechanical means and its application to large scale production of colloids are the novel developments introduced by Plauson in his colloid mill. This apparatus grinds the material, say chalk, in a water suspension after it has first been pulverized as finely as possible in the regular grinding apparatus.

The impact type of mill is shown in figure 1. The mill works continuously. The material enters at 20 and is immediately drawn down by the suction created by the rapidly rotating toothed wheel 2. The central drum 16 is water cooled and also possesses teeth which are arranged in such a fashion that the teeth of the rotating wheel can turn within them, in other words the teeth are staggered. The speed of the wheel is about 40 meters per second, which corresponds to an angular speed of about 8000 to 9000 revolutions per minute. The mixture of chalk and water, for example, is drawn down and is forced to pass between the teeth on the wheels and those on the stationary water-cooled drum. The result is a violent tearing apart and impact effect on the solid matter in the water. Inasmuch as water is incompressible this shock is taken up entirely by the solid matter which is further disintegrated until it is reduced to the colloidal condition. The energy required to accomplish this is very small, being no more than ten horsepower for an average sized experimental machine. This is directly contrary to the usual type of dismembrator, for the simple reason that while in the former the shock of the rotation is distributed through a number of points about the circumference of the rotating parts; in the colloid mill all of the shock is concentrated at one point. The action of the mill is very aptly compared with that of hammer and anvil. The hammer is represented by the rotating part, the anvil by the stationary part. The material worked comes between the two and is subjected to violent shock.

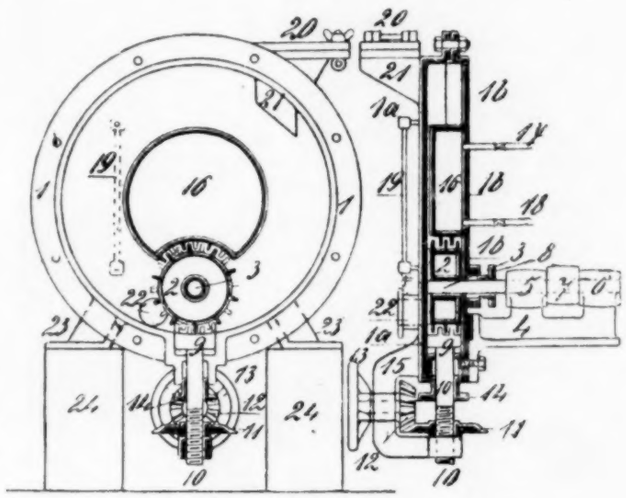


FIGURE 1. IMPACT TYPE OF COLLOID MILL

Figure 2 shows the friction type of mill, in which the shearing action on the solid material is obtained by passing the water dispersion of the same between two hardened steel, oppositely rotating plates. The advantage of this type of mill is that it will give the same results as the impact type when operated at a much lower speed.

Its Application to Rubber Industry

The size of the grain of the materials used in the compounding of rubber is of considerable importance in determining the quality of the rubber product. This is particularly true in respect to the life of the rubber article. Most rubber-ware is subjected to continual repeated elastic deformation, and if the filling material has been used in the form of coarse crystalline grains, these will cut the rubber much like powdered emery. Rubber heels or rubber tires for example which are subjected to alternate compression and expansion, made with coarse grained fillers go through a grinding action similar to what takes place in a ball mill. The rapid wearing away of tires and other rubber articles of similar nature may be explained in this way.

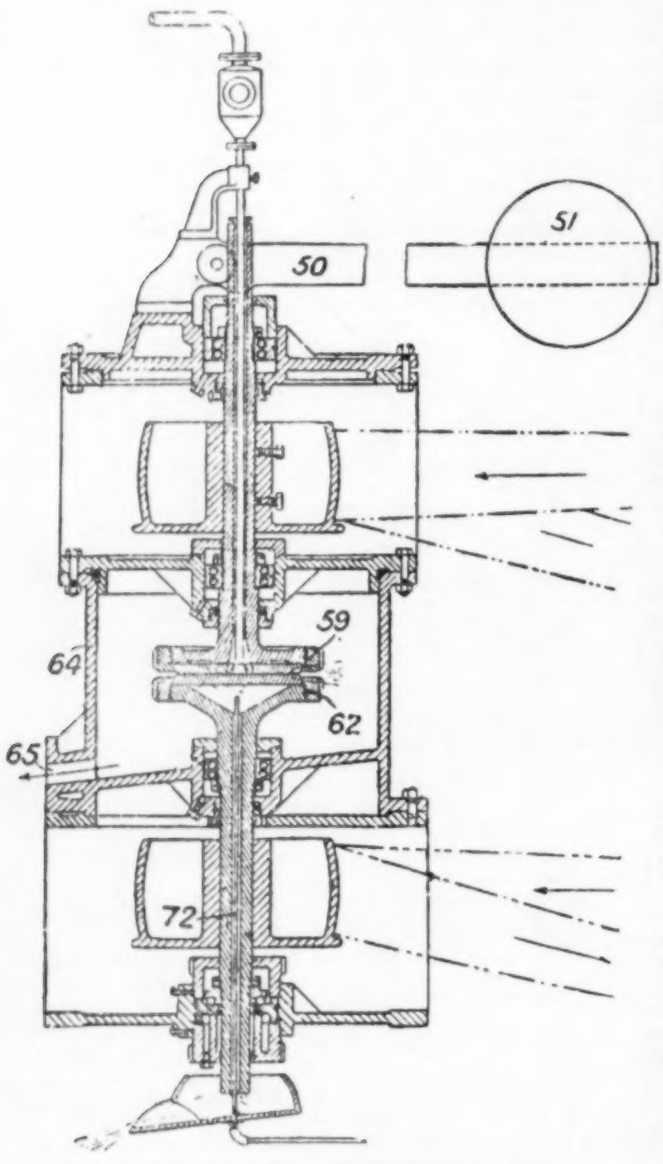


FIGURE 2. FRICTION TYPE OF COLLOID MILL

The use of colloidal fillers does away with this grinding effect entirely with a consequent important increase in the life of the article. Furthermore rubber itself being a colloid forms mixtures with colloidal graphite, chalk, sulphate of barium, etc., which present a homogeneity far more perfect than that attainable hitherto. The rubber mixture instead of being an agglomeration of various substances now becomes a colloidal emulsion. The ingredients cannot separate out naturally or be separated by the usual filtration processes.

It has also been found that when the various accelerators are used in colloidal form their action is considerably increased. Tests have been made with such accelerators as litharge in the colloidal state and have proven that a smaller quantity of the colloid accelerator will give the same results as a larger quantity of the same substance in the ordinary condition.

Due to the fact that the colloid materials have a much greater surface area for the same weight of non-colloid fillers and pigments it is possible to use considerably more of the fillers in the compounding of the rubber without any disastrous effects. The intensification in the coloring power of such pigments as cinnabar, ochre, sulphurated antimony, etc., when these materials are ground in the colloid mill, makes it possible to economize in the use of these expensive pigments, as in the colloidal condition only a fraction of the amount ordinarily used is required. The same thing holds good of the sulphur employed in the vulcanization process. Only a comparatively small amount of colloidal sulphur is required to effect vulcanization. Furthermore, the vulcanized articles do not exhibit any phenomena of efflorescence, and the subsequent formation of sulphuric acid and destruction of the rubber are avoided.

The Regeneration of Old Rubber

A further interesting application of the colloid mill is in the regeneration of rubber. In this process the rubber itself is ground up in the colloid mill. For example old rubber tires are disintegrated in the presence of water in this mill. The mass soon becomes homogeneous and acquiries the appearance of an emulsion. The free sulphur is in part suspended in the colloidal state in the liquid and in part dissolved in the materials accelerating the dispersion. Benzene or gasoline can also be used in the place of rubber. Various colloid accelerators may be added, such as starch, dextrine, albumin, casein, soap, etc. The separation of the sulphur is facilitated by the presence of alkalis, amines or sulphide of ammonia. The rubber is recovered in this process in the form of a latex. The operation can be carried within a considerable temperature range from 15 to 120 degrees C.

General Advantages of the Colloid Mill

The following advantages are claimed for the colloid mill in its use in the rubber mill.

1. It allows the attainment of a homogeneous rubber compound.
2. It accelerates the vulcanization process.
3. It makes possible an increase in the weight of filling material added to the rubber and thereby lowers the cost of the finished article.
4. It increases the elasticity of the rubber product. (This claim seems to be somewhat far-fetched).
5. It increases the coloring power of pigments used in the compounding rubber and thereby reduces cost of same, as not so much need be used to attain the desired effect.
6. It increases the rate of absorption of sulphur and renders the same more complete and avoids efflorescence and attendant injurious effects.
7. It lengthens the life of the vulcanized article.
8. It improves the process of regenerating old rubber.
9. It enables the production of colloidal hard rubber which is used to good advantages in making insulating material for electrical purposes.

Products Resembling Rubber

German Patent No. 331,334 is concerned with a process of making products which resemble rubber from resins or balsam resins. These are melted with chloride of calcium. Then the mixture which is obtained in this manner is subjected to repeated distillations each accompanied by the addition of more chloride of calcium and chloride of lime. The result of this treatment is a substance that looks just like rubber latex. This is then mixed with crude or regenerated rubber and the mixed product is vulcanized in the regular manner. It is possible to incorporate synthetic rubber with this mixture.

Conditions on Rubber Plantations

By J. William Oliver

Of Oliver, Keeler & Scudder, Crude Rubber Brokers

THE unstable and uncertain conditions in the various crude rubber markets induced the writer to undertake a trip in August, 1921, to the primary markets, also to the European centers of the trade to obtain, if possible, a comprehensive idea of actual conditions and the probabilities of the future.

The problem of the primary markets is in no way analogous to the situation in the American markets, except in that they are dependent upon our markets principally for the sale of their products. Due to the established practice of most estates of engaging in future contracts for some part of their production at prices that cover expenses for the period of the contracts, the radical drop in prices was not of such serious consequences to such estates as it was to those estates which did not have such future contracts. It is a fact that some of these old contracts are still in force and as a result such foresighted estates are in a comparatively easy position.

However, the major portion of these contracts matured some months ago so that in September and October last the Far Eastern markets began to feel the full effects of the change in conditions, considerably after the importing markets had passed through their period of demoralization.

J. William Oliver

Many Estates Neglected

Many estates, some of them of large acreage, have permitted their plantations to be neglected; considerable under-brush is appearing and a young jungle is not far away. European employes are being sent back to their homes on every steamer, and the coolie labor is being allowed to leave so that a curtailment in operating forces, which may prove to be a serious factor in the future is actually taking place. The curtailment is most apparent on the European-owned plantations as their over-head is a real factor, whereas the native owner, although usually a small holder yet large in the aggregate, has minimum overhead, and as a result is maintaining his production at low cost, although the quality of the product is not of the highest grade.

"I went out by way of San Francisco, and returned by way of Ceylon and London. My longest stay was naturally at Singapore from which point I took trips to various points in the Federated Malay States. I went by automobile from Port Swettenham to Penang, through one of the richest of the rubber producing sections. I interviewed plantation managers, foremen and in fact everybody from whom I could get any information. On many estates I found only an acting manager or caretaker left. Most of them were doing absolutely nothing in the way of keeping up the plantations. They could not renew tappings or clear jungle without authority from London, and this authority failed to come. It was a depressing sight to see these magnificent plantations being left to go to wrack and ruin through pure neglect, as those in this section are said to be the finest in the world.

Office and Rubber Mill of Neesoon & Son, Ltd., Singapore

The Situation in the Federated Malay States

The situation in the Federated Malay States as regards rubber is similar to the situation of our southern states as regards cotton. It is their chief agricultural product, and the population there has come to depend on it. One of the live issues in British Malaya at present is the diversification of agricultural production. They are now agitating in favor of growing the oil palm, as there is a big market for palm oil and most of it now comes from Africa.

The problem of experienced rubber plantation labor is fast becoming serious. Practically all of the rubber estate managers complained bitterly of the necessity of discharging their native workers, whom they have trained over a number of years of service. To fill their ranks, should it be found necessary and as they all hope it soon will be, seems hopeless, since the native labor is returning to India and other countries. To substitute Chinese labor would mean a much larger payroll as Chinese is the highest priced labor in the Far East.

Like in every slump there is an indifferent feeling regarding the value of keeping up organization partly due to lack of finances as well as a pessimistic view of the future. On the other hand, not a few estates are cutting down their operating expenses in a most radical manner with the idea in mind of producing rubber at the lowest possible cost. In order to reduce cost materially it is believed the capitalization of many estates must be reduced. That some few estates can produce rubber ex godown in the neighborhood of about 10d is undoubtedly true, but the cost price of the majority is far higher.

On the part of not a few rubber planters and traders there is a disposition to view their problems in a more practical light, and recognize that the consumptive power of the world as well as the financial, social and industrial conditions, govern to a large extent the price not only of rubber but of all other commodities.

The governments of the Straits Settlements and the Federated Malay States have been

compelled to take a more sympathetic interest in the destiny of plantation owners since these governments are dependent for their income on the prosperity of the rubber business. Various schemes have been suggested and considerable influence has been exerted to induce the British Government to subsidize the rubber producing industry but without success.

Colombo, Ceylon, apparently was not suffering from the same demoralization as other rubber producing centers for the reason that they produce other commodities.

It is also true that Java has not been so adversely affected by the slump in rubber, as they produce sugar at a price which assures them of the market in China even though at a small profit. Java also enjoys a revenue from her tobacco crops.

It is no secret that London is still carrying very heavy stocks but since the pound sterling is now around 4.20 and not 3.60, obviously the actual return to the holders of these stocks is much greater than it has been in the past when sterling was at a much lower level. London liquidations are not unlikely from time to time.

I found in the rubber centers of the Far East that only the most optimistic reports concerning the American rubber and automobile industries were circulated, but whether the report was optimistic or otherwise, it was always interpreted in an optimistic manner. It is a dangerous thing to believe the consumptive power of an individual or a trade is unlimited, yet that is what many of them over there think about the American rubber trade.

Of course, the best informed and more conservative rubber merchants in the Far East with whom I talked recognized the danger of any sudden rise in the price of crude rubber. They had confidence that prices would gradually work back to levels that would give satisfactory profits both to planters and traders, but they would not hazard any prophecies as to when this would come about.

While in Singapore I made arrangements for my firm to introduce into this market Neesoon & Sons, Ltd., one of the large producers and an old rubber factor. The accompanying photographs show their offices and mill which are among the largest and best equipped in Singapore, also a view of one of their plantations.

FACTORY WAREHOUSE OF NEESOON & SONS, LTD., SINGAPORE. GROUP OF OFFICERS AND HEADS OF DEPARTMENTS IN FOREGROUND

International Cooperation in Standardization

The American Engineering Standards Committee has just completed arrangements by which cooperation with the standardizing bodies in other countries will be made more effective. In doing this it has followed out the recommendations of the Unofficial Conference of the Secretaries of the National Standardizing Bodies held in London in April 1921.

In order that all standards shall be available to the industries of the various countries, it is planned that each national body will sell the approved standards of the other bodies. The American Engineering Standards Committee (29 West 39th St., New York City) has available the publications of the standardizing bodies in Austria, Belgium, Canada, France, Germany, Great Britain, Holland, Sweden and Switzerland.

Hereafter the A.E.S.C. will regularly exchange information with the foreign bodies as to the status of work on the various projects being undertaken under its auspices. This information will be limited to the indication of the stage of development of the projects, it being left in each case to the various sectional committees and sponsor bodies to decide to what extent they desire to exchange technical memoranda or drafts of standards. This exchange of information on the general progress of the work will, however, lay the basis for closer international cooperation as the need for this develops in special instances.

VIEW ON ONE OF THE PLANTATIONS OWNED BY LIM NEE SOON, CHAIRMAN OF NEESOON & SONS, LTD.

Relation between Rubber and Paints

In the past there have been published several abstracts in this section on the use of rubber in the manufacture of new and novel paint preparations. Much interest is attached to the parallel, drawn by M. F. G. Breyer, of the close relationship between the properties of rubber and paints. He states that in each of these substances the pigments play the same role. The reasons for his conclusions are:

1. Both rubber and paint are suspensions of solid particles, having a maximum diameter of about 5 microns, in a plastic medium.

2. Each of the materials is used in a modified form in the case of the paints. this modified form is attained by the use of driers; in the case of rubber it is brought about by the vulcanization process.

3. The utility of the paints and of the rubber is measured principally by their elastic properties.

NEWS OF THE INDUSTRY

The Rubber Trade in Germany and Austria

Paul Elbogen of Fred Stern & Co., Inc., the Crude Rubber Importers, Finds German Manufactures Busy, but Economic Uncertainty Holding Back—The Depressed Currency Problem

Paul Elbogen, vice president of Fred Stern & Co., Inc., the crude rubber importers, of 277 Broadway, New York, who spent ten weeks in Europe last fall, in an interview with a RUBBER AGE representative made some interesting observations on the rubber trade in Germany and Austria where he spent some time.

Conditions in Hamburg, the center of the crude rubber trade, he found were as normal and active as before the war. In fact he found great activity the order of the day throughout the entire trade in Germany and Austria. The Dutch crude rubber houses of Amsterdam and Rotterdam were doing the greatest volume of business with the manufacturers, although the British crude rubber houses were making a big effort to obtain their share. The manufacturers were also getting large supplies of crude rubber direct from the primary markets in British Malaya and the Netherlands East Indies.

"Before the war," he said, "Germany used to get substantial shipments of crude rubber from her own colonies in Africa. These are no longer coming in.

"I found the crude rubber trade at Hamburg in practically the same hands as before the war. In fact, it seemed quite remarkable after all that has transpired to note how much the same business was going on now as then.

"I visited the great factories of the Continental rubber works at Hanover and found them in a period of great activity. Everything appeared to be driving forward with wonderful energy. The manufacturers reported that they could obtain all their supplies of raw materials at normal prices and that the wages paid labor were much less than in other companies. They reported that they were enjoying an extensive export trade as they evidently were able to sell cheaper in foreign markets than their foreign competitors. This is largely because of the cheaper labor. A workman before the war who received the equivalent of $1.00 per day considered that he was well paid. He now gets a much higher compensation in marks but the purchasing power of the mark has diminished greatly so that the workman really gets much less than before.

"Exchange was so low while I was there that $1.00 of American money would buy about 260 marks. (At this writing the value of the mark is about 200 to the dollar.) This made Germany one of the cheapest places in the world for a foreigner to live, but terribly expensive for the Germans. The problem of the currency is the great internal problem of Germany today. Will the currency go bankrupt or will it survive? That, of course, is an economic question I would not pretend to express an opinion on. Nevertheless living conditions were excellent and food of all kinds plentiful.

"Similar conditions prevailed in Austria where the value of the crown is still more depressed than the mark in Germany and where the foreigner with

PAUL ELBOGEN

money found the expense of living still more in his favor, and the Austrians themselves found the purchase of necessary food still more difficult.

"Such uncertainty about the currency makes the manufacturers uncertain about their plans for the future. They do not dare to plan very far ahead or to increase their capacity. The bankruptcy of the currency is a very imminent issue with them, as it has happened before in Europe. This is the bugaboo that is ever before their eyes.

"Yet in spite of all this uncertainty the rubber factories throughout Germany and Austria have been declaring satisfactory dividends. Their manufacturing methods are strictly up-to-date, and one finds on all sides the effort toward strictest economy.

"Besides the works at Hanover, I visited the plants of the Harburg-Vienna Rubber Co. at Harburg, Germany, and Wimpassing, Austria, and the Austro-American Rubber Works at Vienna.

"One now sees cord tires principally in Germany and Austria, and quite a few American-made tires especially in the sizes for Ford cars.

"It is, of course, difficult to predict the future of the German rubber industry, but you can rest assured that they are working very hard over there and striving in every way to retrieve whatever the war cost them. If their financial and economic problems of the nation shall be solved, they will again become leading competitors in the world's markets."

Annual Report of Victor Co. Shows Profits

The annual report of the Victor Rubber Company, Springfield, O., submitted to the stockholders' meeting in that city on January 26, showed profits from operation in 1921 of $237,705.44, which amounts to $5.02 per share on outstanding common stock in that year.

"During the year," says the report, "all prior, current and anticipated losses have been written off the company's books and reserves provided in the total amount of $735,747.92. The company's material purchases and inventories have been made and carried on the books at current market prices the last half of the year.

"A total of 113,199 tires were sold, an increase of 55 per cent over the previous year. Sales of tires, tubes and mechanical goods amounted to $2,201,722, an increase of 9 per cent."

The comparative, condensed operating statement shows that the cost of sales and operation decreased in 1921 under the previous year by $133,250.54, leaving a net operating profit of $237,705.44. The assets as of Dec. 31 are given as $1,832,019.40.

Akron-Universal Tire & Rubber Co. Holds Annual Meeting

The annual meeting of stockholders of the Akron-Universal Tire & Rubber Co., Medina, Ohio, was held at the company's factory on January 17. Roy Kimmell, president, called the meeting to order and introduced C. R. Baker, former president, who stated that an amicable agreement had been reached between the directors and himself by which he was to withdraw entirely from the company other than holding certain stock in his possession. A new board of directors was elected as follows: R. E. Kimmell, D. R. Pelton, L. H. Randall, C. E. Hoover, H. W. Coding, J. A. Clark, A. P. Haight, J. A. Clarke and R. J. Hyde.

Seamless Rubber to Rebuild

The Seamless Rubber Company, Inc., has been granted a permit to rebuild their factory on Hallock avenue, New Haven, Conn., recently destroyed by fire. Work will be commenced immediately, and $150,000 will be expended. Despite the fire the company has not laid any hands off.

Promotion for Two Well-Known Goodrich Men

W. O. Rutherford, vice-president in charge of sales of the B. F. Goodrich Company, has announced the appointment of H. C. Miller and C. E. Cook as assistant general sales managers, effective as of January 2, 1922.

This change will not materially affect the duties of either of these officials although their responsibilities and authority will be increased. The statement is made that this will result in a closer executive control of all the selling problems of the corporation.

Mr. Miller will have supervision over sales of all tire lines, embracing pneumatic automobile tires, solid and pneumatic truck tires, motorcycle and bicycle tires. Mr. Cook will have supervision over the corporation's sales of mechanical rubber goods, druggists' rubber sundries, hard rubber products and rubber footwear.

H. C. Miller

Harry Miller is very well known in the tire industry. It has been said that an automobile show without him present would lose as much in interest as would a Republican National Convention without the presence of Uncle Joe Cannon. Twenty years ago he was the Goodrich Branch Manager at Detroit when the automobile manufacturer and the tire maker shared together in that dream about the future when a car and its tires could make a century run without disaster. He is a distinctive feature in that small crowd of pioneers, the "old guard" of motordom. No man is better fitted to talk on the development of the industry or of its future progress.

C. E. Cook has served almost twenty years as a Goodrich man. He advanced to the position of Pacific Coast manager handling the important problems of the corporation for a long period. He later came to Akron where he has operated as head of the mechanical goods division.

Because of the fact that Mr. Cook's activities bring him into close contact with nearly every important industry of the United States where rubber products in some form or other are used, his comments upon the general business situation are of great interest.

"The members of my own division" he said, "are entering into the year of 1922 with an optimism which is the result of an actual personal study of business conditions so far as they relate to the consumption of the rubber products handled by that division. My own observations made in the principal commercial centers of the country convince me that while we cannot expect a boom which we would welcome if we were assured of it, we can look forward to a healthy growth that will bring our business back to the condition which so many manufacturers are fond of mentioning as normalcy. We are planning for just such an increase and our men are satisfied that the pull will be an upward one from now on."

Crude Rubber Restriction to Continue

The Rubber Growers' Association of London has issued the following letter to all producers of Plantation Rubber under date of December 30, 1921:

"With reference to circular dated November 29, 1921 [Rubber Age, December 25, 1921, page 200] advocating a continuance during the first six months of 1922 of their scheme of voluntary restriction of output, the Council have to report that the required minimum of assents has not been received.

"The total area in bearing owned or controlled by the 531 produce members of the Association is estimated at 862,000 acres, of which 788,000 acres are controlled in Europe and 74,000 acres are controlled in the East.

Forms of assent have been received from Members domiciled in Europe controlling	460,000 bearing acres
Cabled advice has been received from Malaya that the producing area of local members assenting to the restriction scheme is	13,000 " "
making	473,000 bearing acres

which represents 55 per cent of the total.

"Assents have also been received from non-members in respect of 25,000 bearing acres. Letters received from other members show that 30,000 bearing acres will conform to the scheme without formal assent being given, while a further 90,000 bearing acres will be under substantial restriction. No reply in writing has been received from the owners of 200,000 acres controlled in Europe but from inquiries made personally it is clear that restriction will be carried out by most of these.

"While the Council regrets that its scheme thus cannot be made binding it is evident that the necessity for continuing to restrict output is appreciated by a large proportion of the members of this Association, and the Council has no doubt that this policy will be continued on an independent voluntary basis."

Donovan Now a Manufacturers' Representative

John F. Donovan, who for the past six years has been connected with the general purchasing department of the United States Rubber Company, is now located at 1674 Broadway, New York, as a representative of a number of well-known manufacturers of rubber compounding materials. His experience with the United States company, where he had charge of purchasing these commodities, has given him an extensive knowledge of the use of such ingredients in the manufacture of rubber goods which will be of great service in promoting their sale.

C. E. Cook

The Crude Rubber Clearing Committee

The Clearing Committee of the Rubber Trade Association of New York, Inc., 75 Maiden Lane, is constituted as follows:

Chairman, William H. Stiles of William H. Stiles & Co.

James T. Johnstone of J. T. Johnstone & Co.

H. A. Astlett of H. A. Astlett & Co.

Otto Meyer of Meyer & Brown.

William E. Bruyn of L. Littlejohn & Co.

This is among the most important Committes of the Association having charge of the work of the Clearing Department, which has done so much to facilitate and smooth out transactions in the New York crude rubber market.

The British Industries Fair

Manufacturers will be interested to learn that the British Industries Fair, organized by the Department of Overseas Trade of Great Britain will be held at both London and Birmingham February 27th to March 10th. The rubber trades will exhibit at Birmingham.

Rubber Goods Exports for 1921

Figures Given Out by the Rubber Division of the Federal Bureau of Foreign and Domestic Commerce Covering all Branches of the Trade — Tire Exports Exceed $20,000,000

Through the courtesy of P. L. Palmerton, chief of the Rubber Division of the Federal Bureau of Foreign & Domestic Commerce, Washington, we are enabled to publish the following figures of the exports of rubber goods during 1921 several months in advance of the time these figures have before been available. The figures are given out in advance of general publication and are subject to correction.

Countries—	Automobile Tires: Casings	Automobile Tires: Inner Tubes	Solid Tires	All Other Tires	*All Other Manufacturers of
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Austria	....	....	95	....	880
Azores and Maderia Is.	465	4	....	....	161
Belgium	63,582	10,733	....	8,919	43,819
Bulgaria	....	....	....	....	386
Czechoslovakia	7,794	774	....	15	81
Denmark	258,630	15,333	5,407	3,134	20,047
Esthonia	4,316	....	....	100	....
Finland	43,959	1,472	2,414	1,005	2,707
France	380,985	2,673	700	254	346,400
Germany	11,868	1,415	....	358	3,898
Gibraltar	366	142	....	....	432
Greece	101,295	9,654	589	32	1,428
Iceland and Faroe Is.	6,692	299	....	....	153
Italy	24,700	410	....	245	34,730
Malta, Gozo, & Cyprus Is.	11,801	4	....	....	1,138
Netherlands	95,794	14,310	1,924	5,379	26,210
Norway	284,487	15,511	20,258	7,936	17,063
Poland and Danzig	22,597	3,207	7,098	5,500	1,753
Portugal	16,694	432	40	124	325
Rumania	35,078	7,668	3,146	1,347	827
Spain	270,782	18,227	22,832	19,503	53,198
Sweden	510,247	34,730	21,265	5,422	44,065
Switzerland	94,552	1,824	....	3,033	19,131
Turkey in Europe	38,119	5,056	1,328	....	5,465
England	2,969,245	238,438	144,325	9,282	1,124,040
Sco land	3,899	203	288	83	47,770
Ireland	753	88	....	....	8,331
Yugoslavia, Albania, etc	18,776	430	1,530	....	1,174
Latvia	47	....	....	....	200
Lithuania	1,214	202	....	....	572
Bermuda	50	64	....	2,245	2,959
British Honduras	3,680	1,280	30	128	365
Canada	826,563	131,828	82,777	25,655	1,444,831
Costa Rica	6,969	1,013	1,368	829	3,743
Guatemala	36,360	4,693	633	2,124	9,198
Honduras	17,624	2,122	3,783	232	7,868
Nicaragua	10,180	1,951	....	241	2,377
Panama	114,596	20,486	11,974	16,553	29,048
Salvador	40,486	5,597	4,888	1,197	3,185
Mexico	1,173,826	142,697	51,730	49,740	352,129
Miquelon, Langley, etc.	....	....	....	....	267
Newfoundland & Lab.	16,033	2,314	327	274	8,727
Barbados	27,108	3,473	1,826	1,623	2,794
Jamaica	96,112	7,588	27,284	2,272	7,991
Trinidad & Tobago	95,274	10,584	16,783	1,292	9,477
Other Brit. West Ind.	16,023	2,449	1,263	3,542	1,376
Cuba	1,029,130	118,133	223,845	36,558	156,381
Virgin Islands of U. S.	12,505	2,221	14,501	626	2,048
Dutch West Indies	16,004	1,698	....	211	1,675
French West Indies	16,071	2,132	2,695	1,437	314
Haiti	35,227	4,776	150	710	4,585
Dominican Republic	121,168	13,856	3,787	2,745	10,335
Argentina	739,306	68,938	29,716	9,695	143,806
Bolivia	8,821	914	405	206	1,258
Brazil	211,553	6,252	8,889	1,747	50,448
Chile	92,321	12,939	7,078	733	47,794
Colombia	54,087	5,640	4,587	1,542	13,703
Ecuador	26,065	3,291	688	....	3,091
Falkland Islands	....	486	....	....	....
British Guiana	17,114	3,361	1,466	45	1,707
Dutch Guiana	3,893	508	....	530	493
French Guiana	200	122	....	....	244
Paraguay	376	127	....	....	106
Peru	142,881	17,770	15,228	329	20,119
Uruguay	152,145	4,968	751	1,850	37,705
Venezuela	125,595	14,342	2,540	1,036	12,069
Aden	8,150	399	....	346	70
China	117,597	5,422	3,566	363	84,167
Kwantung	106	....	....	....	220
Chosen	6,553	1,820	....	....	381
British India	256,756	17,344	116,831	3,222	28,211
Straits Settlements	63,251	7,462	41,253	3,427	2,546
Other Brit. East Ind.	4,372	1,803	1,819	....	643
Dutch East Indies	374,573	31,149	96,076	2,823	36,630
French Indo China	3,443	58	....	....	136
Greece in Asia	4,151	366	326	....	50
Hejaz, Arabia, &c	8,287	449	....	5,576	....
Hongkong	40,974	2,343	5,178	4,128	17,495
Japan	146,071	10,860	34,546	3,660	286,083
Palestine & Syria	28,164	5,370	432	1,200	2,162
Persia	3,335	126	....	....	1,300
Russia in Asia	....	....	....	392	416
Siam	11,084	463	286	....	920
Turkey in Asia	53,446	6,771	1,980	....	2,529
Australia	53,446	19,154	16,959	7,423	73,380
New Zealand	542,145	16,419	56,139	26,168	47,536
Other Brit. Oceania	9,704	2,761	1,485	1,576	263

(Continued on Page 332)

Ajax Reports a Loss

The profit and loss account of the Ajax Rubber Company, New York City, for the first nine months of 1921, as filed with the New York Stock Exchange, shows a loss, before providing adjustment of inventory and commitment valuations, interest on borrowed moneys and Federal taxes of $2,446,642. Total loss for the period, after interest, adjustment of inventory and other charges, was $2,966,445. The profit and loss surplus on Jan. 1, 1921, was $1,615,480, so that the deficit of $3,966,445 for the nine months caused a profit and loss deficit of $2,350,964 as of Sept. 30, 1921.

Many Denman-Myers Men go to Warren

The removal of the main offices of the Denman-Myers Cord Tire Company from Cleveland to Warren, Ohio, brought many of the company's executives to the latter city. Walter E. Myers, president, Walter R. Denman, secretary and general manager in charge of tire production; L. M. Harper, assistant secretary; E. A. Fisher, accountant; C. L. Mason, sales manager; and H. P. Hahn of the sales department.

Interlocking Cord Tire Co. Holds Election

At a recent meeting of stockholders of the Interlocking Cord Tire Company, Akron, Ohio, the following directors were elected: A. N. Burckhardt, Edward Kohl, W. F. Lybarger, C. A. Rukamp, Charles Fornecker, A. W. Sweeny, B. F. Lepper, Ralph W. Barr, W. H. Maston, R. E. Cartledge, B. F. Hood, F. S. Prior and W. E. Fulton. The directors elected the following officers: A. N. Burckhardt, president; Edward Kohl, vice president; C. A. Rukamp, secretary and Charles Fornecker, treasurer.

Rubber Cushion Horseshoe Co. to Apply for Charter

At a meeting of stockholders of the newly organized Rubber Cushion Horseshoe Company, New Castle, Pa., on January 19 officers and directors were elected and preparation made for an application for a charter. The company will be capitalized at $100,000, fifty-one per cent of which will be common stock and forty-nine per cent preferred, par value $50.

The following directors were elected: John M. Bevan, W. R. Bumbaugh, Thomas Barea, George Turner, Thomas Morgan, Carl Campbell, A. M. Everheart and D. R. Smith. The directors then organized and elected the following officers: John M. Bevan, president, W. R. Bumbaugh, vice-president; Thomas Barea, secretary; and George Turner treasurer.

A new rubber cushion horseshoe is an innovation invented by A. A. Bumbaugh of Warsaw, Ind. The company was organized at New Castle through the efforts of John M. Bevan.

French Oceania	10,192	1,075	3,739	1,290	209
Other Oceania	4,030	331	497	144	180
Philippine Islands	445,746	55,892	154,935	55,856	134,502
Belgian Kongo	....	....	....	....	146
British West Africa	132,908	18,226	540	53	248
British South Africa	241,539	11,037	3,912	429	68,547
British East Africa	48,584	3,797	535	....	3,540
Canary Islands	23,609	998	344	....	375
French Africa	2,609	495	2,638	296	594
Kamerun, etc.	825	94	....	....	....
Liberia	16	145	....	....	80
Morocco	1,940	439	572	....	70
Portuguese Africa	174	208	1,262	7	3,594
Egypt	48,118	5,040	....	966	5,339
Total	13,422,266	1,232,168	1,300,081	358,963	5,003,162

* The class "All Other Manufacturers of" does not include scrap or old rubber, reclaimed rubber, or any item shown separately in Parts 1, 2, or 3.

Rubber Footwear

Countries—	Boots Pairs	Boots Dollars	Shoes Pairs	Shoes Dollars	Soles and Heels Dollars
Austria	....	....	40	50	....
Azores and Medeira Is.	....	....	42	38	67
Belgium	146	428	17,800	15,058	32
Bulgaria	....	....	13	16	....
Denmark	1,046	1,348	105,634	111,901	3,350
Esthonia	....	....	10,047	25,069	....
Finland	....	....	124	140	55
France	....	....	7,030	5,577	60
Germany	....	....	94	107	15
Greece	....	....	32	46	126
Hungary	....	....	....	....	275
Iceland and Faroe Islands	2,992	8,908	19,446	24,487	694
Italy	685	2,187	6,738	4,557	412
Netherlands	84	257	14,127	13,370	2,477
Norway	1,136	2,114	245,334	221,300	7,532
Poland and Danzig	....	....	23,605	19,822	340
Portugal	761	3,519	2,060	2,511	102
Rumania	72	291	12,988	13,379	....
Russia in Europe	....	....	960	2,200	....
Spain	154	475	31,816	25,163	16,134
Sweden	2,386	8,306	22,894	38,117	778
Switzerland	48	117	77,998	69,714	731
Turkey in Europe	....	....	36,219	36,188	656
England	26,082	56,149	126,910	94,669	22,456
Scotland	360	688	68,000	65,433	....
Bermuda	173	613	8,856	13,936	1,969
British Honduras	10	28	12,154	15,388	918
Canada	19,054	70,315	33,221	51,662	3,395
Costa Rica	....	....	653	804	6,598
Guatemala	800	2,300	3,883	5,045	6,082
Honduras	....	....	7,609	11,132	3,324
Nicaragua	265	561	4,356	6,208	8,012
Panama	1,931	4,614	53,844	62,759	23,478
Salvador	....	....	946	1,002	21,741
Greenland	....	....	72	55	....
Mexico	898	3,495	325,371	386,560	86,984
Miquelon, Langley, etc.	3,243	11,258	818	624	29
Newfoundland and Labrador	20,024	62,886	13,658	12,110	6,877
Barbados	....	....	2,966	3,654	51
Jamaica	1	5	38,199	42,392	2,011
Trinidad and Tobago	9	35	11,906	13,392	742
Other British West Indies	....	....	19,782	22,240	1,361
Cuba	1,359	4,976	292,810	304,626	99,627
Virgin Islands of U. S.	1	3	11,266	17,553	1,503
Dutch West Indies	....	....	6,651	7,125	1,313
French West Indies	....	....	7	13	....
Haiti	....	....	1,687	2,831	245
Dominican Republic	76	196	18,733	23,473	2,457
Argentina	638	2,439	189,360	183,824	18,206
Bolivio	132	567	114	118	1,542
Brazil	404	669	54,153	53,963	31,213
Chile	480	1,953	21,863	19,782	890
Colombia	24	71	10,520	12,395	8,251
Ecuador	....	....	10,046	8,292	591
British Guiana	1	5	5,980	6,948	....
Dutch Guiana	....	....	1,040	1,393	566
Peru	610	4,203	1,500	2,145	1,381
Uruguay	1,176	5,273	50,630	48,686	3,660
Venezuela	....	....	527	561	6,281
China	92	333	15,146	16,081	12,422
Kwantung, leased territory	....	....	1,440	1,539	....
Chosen	120	339	864	798	....
British India	97	362	10,188	17,149	406
Straits Settlements	....	....	5,578	7,627	....
Other British East Indies	....	....	768	951	288
Dutch East Indies	24	74	841	1,481	350
Far Eastern Republic	16	28	718	386	....
Hongkong	132	409	19,096	20,649	245
Japan	107,512	235,655	257,779	259,199	1,857
Palestine and Syria	....	....	999	829	1,528
Persia	....	....	9,987	12,064	....
Russia in Asia	687	2,354	144	360	....
Siam	2	11	560	660	....
Turkey in Asia	168	519	5,197	5,849	215
Other Asia	....	....	144	305	....
Australia	3,419	12,624	8,558	11,046	2,010
New Zealand	10,596	44,027	7,215	7,343	12,671
Other British Oceania	....	....	6,844	9,154	....
French Oceania	....	....	4,969	6,538	94
Other Oceania	....	....	2,027	3,324	....
Philippine Islands	1,413	3,240	254,090	302,904	58,590
Belgian Kongo	....	....	26	43	....
British West Africa	73	284	215	304	667
British South Africa	1,554	6,261	8,730	9,345	12,626
British East Africa	....	....	936	900	....
Canary Islands	....	....	312	305	....
French Africa	....	....	1	2	....
Kamerun, etc.	2	13	15	30	....
Morocco	....	....	312	305	....
Portuguese Africa	12	47	....	....	247
Egypt	....	....	19	36	514
Total	213,180	567,832	2,668,850	2,829,109	512,320

(Concluded on Page 333)

Re-Elect Officers of India Tire & Rubber Co.

All officers of the India Tire & Rubber Co., Akron, Ohio, were re-elected at a recent meeting of directors. They are J. M. Alderfer, president; J. K. Williams, vice-president; D. A. Grubb, secretary and sales maanger and Paul C. Searles, treasurer.

To Build Plant at Vancouver

The Pacific States Rubber Company will build a $500,000 plant at Vancouver, Wash. as soon as a site is acquired, according to a statement issued by A. M. Elliott, president. The company, which is capitalized for $2,500,000 with $1,500,000 preferred and $1,000,000 common stock, will manufacture tires and tubes, eventually adding a full line of rubber goods.

Powertown Tire Corp. Holds Annual Meeting

The annual meeting of the Powertown Tire Corporation, Rochester, N. Y., was held at the company's offices on January 9. President Costello reported that the volume of tires manufactured in 1921 was more than 300 per cent greater than for the preceding year. The officers elected for the ensuing year are: Thomas J. Costello, president; H. J. Crowder, vice-president; Ernest W. Ewell, treasurer; A. M. Johnson, secretary; and E. O. Benning, director.

The Powertown Tire Sales Company, a subsidiary, also held its annual meeting on January 9. The following officers were elected: A. M. Johnson, president and treasurer; J. B. Corcoran, vice-president; Arthur E. Hagen, secretary.

Goodrich Loss $9,000,000 in 1921

A preliminary statement of the position of the B. F. Goodrich Company for the year ended Dec. 31, 1921, was issued after the meeting of directors held on January 25. Total sales for the year were about $87,000,000 and the loss was about $9,000,000, due chiefly to a further heavy decline in the market values of raw materials which required additional adjustment of inventory valuation at the close of the year.

Current assets were put at $51,500,000 as of Dec. 31, 1921, and current liabilities at $3,300,000. The company, it is said, entered the year 1922 without bank indebtedness, against bank loans of $29,000,000 a year ago, and officials say that combined inventories of rubber and fabric on hand and under contract have been adjusted to the market values as of the close of 1921. Selling prices are said to be unduly low, but with a reasonable volume of business, together with economies in operating costs, it is expected that a fair margin of profit will be earned in 1922.

Directors declared the regual quarterly dividend of $1.75 a share on the preferred stock, payable April 1 to stockholders of record March 22.

Countries—	Belting Dollars	Hose Dollars	Packing Dollars	Druggists' Sundries Dollars
Austria	368	....	....	....
Azores and Madeira Is.	....	2,913	29	159
Belgium	4,886	8,337	7,357	3,799
Bulgaria	....	2,522	....	....
Czechoslovakia	....	....	58	....
Denmark	4,750	4,648	3,039	1,723
Esthonia	....	....	1,400	....
Finland	12,593	1,048	503	....
France	40,636	16,041	5,718	32,064
Germany	3,077	1,550	450	....
Greece	14	6,099	....	....
Hungary	3,000	....	....	....
Iceland and Faroe Is.	....	....	80	....
Italy	....	2,125	707	1,922
Netherlands	23,865	13,682	3,358	21,401
Norway	26,086	6,182	344	1,851
Poland and Danzig	....	694	....	6,055
Portugal	....	1,021	....	838
Rumania	2,405	415	594	439
Russia in Europe	....	50	....	....
Spain	4,150	13,759	450	8,490
Sweden	13,354	12,102	5,560	2,322
Switzerland	6,910	844	....	590
Turkey in Europe	....	4,466	38	577
England	40,020	265,733	51,808	210,575
Scotland	30,033	1,142	3,806	870
Ireland	329	....	485	1,647
Bermuda	568	4,736	913	1,915
British Honduras	57	312	170	542
Canada	84,358	90,641	59,514	203,305
Costa Rica	6,081	5,069	1,859	1,523
Guatemala	5,178	7,176	2,644	2,960
Honduras	10,613	17,672	3,240	3,105
Nicaragua	8,642	1,606	1,796	1,637
Panama	13,831	78,827	15,517	6,327
Salvador	432	2,543	1,127	622
Mexico	254,872	486,219	213,178	75,628
Miquelon, Langley, etc.	916	10	30	....
Newfoundland and Labrador	3,251	4,809	316	831
Barbados	416	112	379	163
Jamaica	7,053	6,576	3,386	2,442
Trinidad and Tobago	4,589	8,996	3,956	1,057
Other Brit. West Indies	1,448	1,847	806	747
Cuba	39,547	165,605	59,782	64,749
Virgin Islands of United States	443	1,624	228	323
Dutch West Indies	11	2,550	592	367
French West Indies	537	27	....	....
Haiti	....	2,344	1,025	1,170
Dominican Republic	5,086	10,935	15,108	5,099
Argentina	54,709	66,055	10,289	34,929
Bolivia	6,557	9,101	139	784
Brazil	43,765	65,785	12,002	16,720
Chile	49,872	47,962	10,656	7,959
Colombia	12,131	19,754	5,989	12,208
Ecuador	856	17,456	1,532	2,699
British Guiana	....	370	1,375	37
Dutch Guiana	663	950	....	468
French Guiana	....	399	278	....
Paraguay	2,996	....	....	33
Peru	103,049	32,792	5,325	5,866
Uruguay	2,068	7,838	1,019	8,290
Venezuela	4,472	6,587	8,121	3,878
China	13,061	25,381	10,934	23,170
Kwantung, leased territory	....	124	....	280
Chosen	574	1,006	453	437
British India	64,014	47,474	7,279	9,640
Straits Settlements	1,837	782	....	2,556
Other British East Indies	....	....	....	396
Dutch East Indies	31,681	20,808	11,861	4,762
French Indo China	8,140	....	517	116
Portuguese East Indies	....	....	....	33
Greece in Asia	....	30	....	....
Hongkong	476	6,958	568	8,992
Japan	12,710	19,134	57,283	7,837
Palestine & Syria	....	212	....	18
Russia in Asia	....	....	....	44
Siam	917	72	....	898
Turkey in Asia	150	144	55	220
Australia	39,185	17,214	30,232	16,002
New Zealand	40,139	11,632	9,824	10,037
Other British Oceania	....	25	264	67
French Oceania	207	314	265	15
Other Oceania	....	30	....	50
Philippine Islands	50,700	36,614	22,938	12,557
Belgian Kongo	4,637	342	....	500
British West Africa	....	....	....	48
British South Africa	214,893	208,564	33,127	10,354
British East Africa	....	224	....	85
Canary Islands	....	....	....	51
French Africa	11,243	352	180	28
Kamerun, etc	....	....	....	32
Liberia	....	....	....	84
Morroco	2,960	....	....	....
Portuguese Africa	2,825	5,380	1,719	17
Egypt	180	1,826	....	1,782
Total	1,446,063	1,945,300	715,574	874,813

Personal

J. K. Williams, one of Akron's pioneer rubber machinery manufacturers, was elected a director of the Franz Foundry & Machine Co. at the annual meeting of the stockholders held January 11.

O. G. Saxon of Arnold Dorr & Co.'s crude rubber department, 93 Front street, New York, left early in January for an extended tour of the rubber producing districts of Brazil. He reported his arrival at Manaos on February 3. During his absence B. B. Millienthal is taking care of the department.

L. L. McAnnaney New Manager, McGraw Cleveland District

Announcement is made by John Morgan, president of the McGraw Tire & Rubber Company, East Palestine, Ohio, of the appointment of L. L. McAnnaney as manager of the firm's Cleveland branch, effective February 1, 1922.

McAnnaney is one of the "old-timers". He has been actively engaged in the sales division of various companies for the past twenty years. For nine years he served as Cleveland branch manager of the B. F. Goodrich Company and previous to his association with the McGraw company, over three years ago, he was manager for the Republic Rubber Company with headquarters in Cleveland. With the exception of a few months, McAnnaney has been covering Baltimore territory for the McGraw Company for the past two years.

British Dunlop Company Reports Huge Losses

The official report of the Dunlop Rubber Co., of London, England for the year ended August 31 last discloses a net loss of £8,320,000, which is more than one-half the company's ordinary share capital. The loss, which is said to be the largest by far declared by a British industrial company, is attributed by the directors almost entirely to depreciation in the stocks of raw materials, principally rubber and cotton, which were bought on future contracts. The report says nothing regarding the value of the company's capital asset or its American factory at Buffalo, N. Y.

The *London Times* discussing the report of the company, says:

"We imagine now that the English company's affairs are straightened to a considerable extent it will be possible to make satisfactory arrangements for the participation of American capital in the American undertaking."

Wilmer Returns from South America

Returning late in January from a two month's trip to South America E. G. Wilmer, president of The Goodyear Tire & Rubber Co., Akron, Ohio, reports that conditions in the southern continent are showing gradual but steady improvement.

"The turn for the better has come a little later there than in United States" said Mr. Wilmer. "Brazil for example is now about where we were six months ago. The business men, bankers and others with whom I talked seemed to feel however that the turn had been definitely made and that things were moving ahead."

Viewing conditions in the rubber industry now as compared to when he left Mr. Wilmer said that steady improvement was plainly evident.

"I don't mean", he said "That there has been a big boom or spurt but that things are moving steadily forward in the right direction insofar as the business of The Goodyear Tire & Rubber Co. is concerned."

MARKETS

Cottons and Fabrics

NEW YORK, FEBRUARY 3, 1922

The possibility of labor troubles in mills because of wage reductions, and disturbed conditions abroad, resulted in a very unsettled cotton market during the fortnight. This uncertainty of the manufacturers and the lack of any general demand weakened perceptibly the prices of the higher grade staples in which our interest centers. Egyptians as well as the American high grades came lower.

There was considerable interest in Pima cotton and those offering this type of cotton were more inclined than heretofore to concede a little in price. The proposed high duty on Egyptian cotton, in the interest of the growers of American-Egyptian or Pima, has stimulated interest in the latter.

GINNING REPORT

Cotton ginned to January 16 from the crop of 1921 totalled 7,913,971 bales, compared with 12,014,742 for the same period from the crop of 1920. Round bales for the same period totalled 123,569, compared with 204,507; American-Egyptian 32,363, compared with 73,695; sea island 3,110, compared with 1,525.

The following were the opening highest, lowest and closing prices, as of February 2, on the New York Cotton Exchange.

	Open.	High.	Low	Close.
March	16.80	17.03	16.75	16.92@16.95
May	16.50	16.74	16.48	16.64@16.66
July	16.09	16.29	16.07	16.20@16.23
Oct.	15.61	15.81	15.61	15.73
Dec.	15.50	15.77	15.50	15.66

CARDED OR COMBED FABRICS

Which is the better? That is the question which is agitating many tire manufacturers. There is no question as to which is cheaper. One tire manufacturer says that he found no advantage in using the combed fabric instead of the carded and felt that the price asked for the combed did not warrant its use. A Western tire manufacturer with his mind on the present low price of tires believes that there will be little or no combed fabric used in tire construction within five years. A New Jersey manufacturer asserts that a large tire company having its own fabric mills uses carded fabric in preference to combed and in fact have no combers in their mills.

Viewing the question from an entirely different angle a Canadian tire manufacturer comes to the defence of combed fabric. He maintains that combed fabric far excels carded in uniformity and this quality he affirms, is more important than merely tensile strength. He gives it as his experience that carded square-woven builder fabric is definitely inferior to combed fabric and its increased use (which he seemingly admits) must be looked upon as a concession to the lowered prices of tires. But it remains for a New York manufacturer to finally settle the question—to his own satisfaction. He insists that it is not a question of carded or combed—any good cotton fabric will do; but manufacturers must learn how to apply the cotton goods and rubber in perfect amalgamation and vulcanization.

EGYPTIAN COTTON

The duty of 20 cents a pound on extra staple Egyptian cotton, which is sought by the Southwestern cotton growers, will possibly keep out the Egyptian staple and help the Pima growers but in the opinion of factors in the industry the latter crop is not sufficiently large to meet the demand of manufacturers who use the Egyptian product. American mills manufacturing tire fabrics now use about 60 per cent Egyptian cotton and as there is a limited supply of Pima will have to turn to our upland, a cotton which more and more is coming into favor with tire manufacturers.

Latest quotations received for Egyptian Sakellarides are 50½ cents per pound for the grade fully good and 37¼ cents for the grade good fair on terms landed at Boston or New York, not including the import duty. Egyptian uppers of medium grade are quoted at 32⅜ cents per pound. Last year Egyptian Sakellarides of the grade fully good were 45⅜ cents per pound and of the grade good fair 36¾ cents per pound. Pima cotton at New York mill points is quoted as follows: No. 1 grade 41½ cents per pound; No. 2, 39 cents; No. 3, 36½ cents.

The amount of Egyptian cotton throughout the world on the first of January this year was 1,040,777 bales (equivalent of 500 pound bales) compared with 1,291,931 bales on the same day last year and 963,588 two years ago. It has been estimated that 90 per cent of the largest cotton and fully 75 per cent of all cotton longer than 1⅛ inches is spun abroad.

TIRE FABRICS

Throughout the market there was a general feeling that when cotton became more settled there would be an improved condition in tire fabrics. At the present time the market is under the depressing influence of the raw material market and prices quoted are merely nominal as the demand for nearby shipments is practically nil. Then there is the proposed tariff of twenty cents a pound on all Egyptian cotton longer than 1⅛ inches to upset both buyer and seller. The ultimate result of such a duty on Egyptians, if this staple with duty added should continue to be used, would be to add to the cost of tire fabrics.

The following prices were heard in the trade:

SQUARE WOVEN				
17¼-ounce Egyptian uppers, combed,	lb.	.70	@	.78
17¼-ounce Egyptian uppers, carded,	lb.	.70	@	—
17¼-ounce Sakellarides, combed,	lb.	.85	@	—
17¼-ounce Sakellarides, carded,	lb.	.75	@	.78
17¼-ounce Peelers, combed,	lb.	.70	@	—
17¼-ounce Peelers, carded,	lb.	.50	@	—
CORD FABRICS				
Combed Sakellarides	lb.	.85	@	.90
Carded Sakellarides	lb.	.80	@	.83
Combed Peeler	lb.	.70	@	.75
Carded Peeler	lb.	.55	@	—
Combed Egyptian uppers	lb.	.75	@	—
Carded Egyptian uppers	lb.	.75	@	—

SHEETINGS, DUCKS, BURLAPS

SHEETINGS—There has been a further easing in sheetings and the demand which is slight is confined to spot goods. For 40-inch, 3.75 yard, 9½ cents was paid and 40 inch, 2.85 yard brought 11 cents.

DUCKS—Factors in this market look for a decided improvement in the spring. At present the market is steady at lowered prices. Single filling sold as low as 13½ cents; double filling brought 17 at 18 cents and hose duck was easy at 31 at 32 cents.

BURLAPS—There has been more activity in burlaps and prices have been steady. Reports from Calcutta would indicate that there is a large stock of finished burlap on hand and that mills are operating only four days a week. This being true it would doubtless prevent any sustained advance in prices.

SHEETINGS					
40-inch	2.50-yard	yd.	.12½	@	—
40-nch	2.85-yard	yd.	.11	@	—
40-inch	3.15-yard	yd.	.12¼	@	—
40-inch	3.60-yard	yd.	.10½	@	—
40-inch	3.75-yard	yd.	.09½	@	—
40-inch	4.25-yard	yd.	.08½	@	—
DUCKS					
Belting		lb.	.37	@	—
Hose		lb.	.31	@	.32
Enameling		lb.	.30	@	.36
Shoe Ducks		lb.	.40	@	.42½
Single filling			.13½	@	.17
Double filling		yd.	.17	@	.18
BURLAPS (Carload Lots)					
7-ounce	40-inch	yd.	3.90	@	—
7½-ounce	40-inch		3.95	@	—
7½-ounce	45-inch		4.65	@	—
10-ounce	40-inch		4.05	@	—
10-ounce	36-inch		4.85	@	—
8-ounce	45-inch		4.75	@	—
10-ounce	45-inch		6.00	@	—
10½-ounce	40-inch		4.10	@	—
DRILLS					
37-inch	3.25-yard	yd.	.10	@	—
37-inch	2.75-yard	yd.	.11½	@	—
37-inch	3.00-yard	yd.	.10½	@	—
37-inch	3.50-yard	yd.	.09⅝	@	.10
37-inch	3.95-yard	yd.	.08¾	@	—
OSNABURGS					
30-inch	7-ounce		.08½	@	.09
40-inch	7-ounce		.10	@	.11

Chemicals and Compounding Materials

THE GENERAL MARKET—New York, February 3, 1922—The market for industrial chemicals presents little material for comment since our last review. Manufacturing consumers continue to pursue a very conservative policy in buying; making few important commitments beyond their immediate necessities. The market in general could not be called weak but rather has taken on the aspect of a waiting market. There has been a slowing up in the demand for some of the more important items employed in the rubber and textile industries, which hesitancy reflects, perhaps, recent labor troubles and the closing down of some of the textile mills.

ACCELERATORS

Organic

Aldehyde ammonia, crystals	lb.	$ .90 @	.95
Aniline oil, bulk basis	lb.	.17 @	.18
Excellerex	lb.	.55 @	—
Formaldehyde-aniline	lb.	.45 @	.50
Hexamethylene-tetramine (powdered)	lb.	.72½ @	.75½
Paraphenylene-diamine	lb.	1.60 @	1.75
Thiocarbanilid	lb.	.40 @	—
Vulcocene	lb.	.35 @	—

Inorganic

Lead, dry red bbls.	lb.	.08 @	.08¼
Lead, sublimed white	lb.	.06½ @	—
white, basic carbonate	lb.	.06½ @	.07¼
Litharge, commercial, bbls.	lb.	.07½ @	.07¾
Lime, hydrated	lb.	.02 @	.02½
Magnesia, calcined, extra light	lb.	.45 @	—
heavy	lb.	.05½ @	—
Magnesite, powdered	ton	50.00 @	65.00

COLORS

Blacks

Carbon Black	lb.	.10½ @	.20
Microntze	lb.	.12 @	.17
Lamp black	lb.	.17 @	.45
Bone "	lb.	.05½ @	.07½
Drop "	lb.	.07½ @	.16
Ivory "	lb.	.15 @	.45

Blues

Prussian	lb.	.50 @	.55
Ultramarine	lb.	.14 @	.35
Cobalt	lb.	.23 @	.30

Browns

Iron oxide	lb.	.05 @	.16
Sienna, Italian, raw and powdered	lb.	.05½ @	.14
Umber, Turkey, raw and powdered	lb.	.04¼ @	—

Greens

Chrome, light, c. p.	lb.	.30 @	.32
medium	lb.	.35 @	.36
dark	lb.	.36 @	.45
commercial	lb.	.12 @	—

Reds

Antimony, crimson	lb.	.35 @	.36
golden	lb.	.21 @	.27
red	lb.	.20 @	.22
Indian, English, pure	lb.	.08 @	.14
Oxide, copperas, pure	lb.	.10 @	.14
reduced	lb.	.11½ @	.12½
Para toner	100 lb.	1.40 @	—
Toluidine tone	lb.	2.50 @	2.75
Tuscan	lb.	.17½ @	.44
Venetian	lb.	.03½ @	.06½
Vermillion, English, quicksilver	lb.	.85 @	.90
domestic	lb.	.25 @	.30

Whites

Albalith	lb.	.06 @	.06½
Aluminum bronze	lb.	.55 @	.60
Lith pone, domestic (factory)	lb.	.06 @	.06½
Zinc oxide, American Horse Head Special	lb.	.08 @	.08½
XX red	lb.	.07½ @	.08
Zinc oxide, French process, White seal	lb.	.11 @	.11½
Green seal	lb.	.09¾ @	.10¼
Red seal	lb.	.08¾ @	.09¼

Yellows

Cadmium sulphide	lb.	1.85 @	—
Chrome, light, c. p.	lb.	.17 @	—
dark	lb.	.17 @	—
medium	lb.	.17 @	—
Ocher, French	lb.	.02½ @	.03½
domestic	lb.	.03 @	.05
Zinc chromate	lb.	.33½ @	—

COMPOUNDING INGREDIENTS

Aluminium flake	ton	25.00 @	29.50
hydrate	ton	20.00 @	22.00
Ammonium carbonate, lump	lb.	.10¼ @	.11¼
Barium dust	ton	100.00 @	—
Barytes, southern off-color	ton	15.00 @	17.00
Western, prime white,	ton	23.00 @	—
Basofor	lb.	.04½ @	—
Beta-naphtol,	lb.	.29 @	—
Blanc fix , dry, f.o.b. works	lb.	.04 @	.04½
Chalk, precipitated, extra light	lb.	.03 @	.03¾
heavy	lb.	.02½ @	.03¼
Clay, China, domestic,	ton	7.50 @	9.00
imported	ton	16.00 @	21.00
Dixie	ton	22.00 @	32.00
Blue Ridge	ton	20.00 @	32.00
Fuller's Earth, powdered	ton	22.00 @	25.00
Fossil flour	ton	60.00 @	..
Glues, extra white	lb.	.30 @	.40
medium white	lb.	.22 @	.26
cabinet	lb.	.18 @	.30
cabinet low grade	lb.	.15 @	.18
common bone	lb.	.08½ @	.14
Graphite flake, bbls.	lb.	.14 @	.20
powdered	lb.	.04 @	.10
Infusorial earth, powdered	ton	60.00 @	—
bolted	ton	65.00 @	—
Mica, powdered	lb.	.15 @	—
Rotten Stone (powdered)	lb.	.02½ @	.04½
Silica (aluminum)	ton	12.00 @	35.00
Soapstone, powdered	ton	.15 @	.20
Starch, powdered corn	cwt.	1.90 @	2.00
Talc, domestic	ton	18.00 @	20.00
French	ton	22.50 @	30.00
French, high grade	ton	40.00 @	45.00
Italian	ton	.47 @	.55
Terra Alba, American No. 1	cwt.	1.85 @	2.00
American No. 2	cwt.	1.25 @	..
Tripoli	lb.	.02½ @	—
Whiting, commercial	cwt.	1.15 @	—
Quaker	ton	13.00 @	15.00
English cliffstne	cwt.	1.75 @	2.00
glider's bolted	cwt.	1.20 @	1.35
Paris white American	cwt.	1.25 @	1.35
Zinc Oxide— 5 per cent leaded	..	.07¼ @	.07¾
10 per cent lead sulphate	lb.	.07 @	.07½
20 per cent lead sulphate	lb.	.07 @	.07½
35 per cent lead sulphate	lb.	.07 @	.07½

(Also see whites)

MINERAL RUBBER

Gilsonite	ton	70.00 @	—
Genasco (factory)	ton	50.00 @	—
Hard hydrocarbon	ton	35.00 @	38.00
Soft hydrocarbon	ton	33.00 @	35.00
Pioneer M.R.	ton	36.00 @	54.00
320 M. P. hydrocarbon (c. l. factory)	ton	47.50 @	50.00
300/310 M. P. hydrocarbon (c. l. factory)	ton	42.50 @	45.00
Synpro, granulated, M.R. (factory)	ton	54.50 @	64.50

SOFTENERS

Acids

Acetic, 28 per cent	cwt.	2.50 @	3.00
Carbolic (phenol)	lb.	.11½ @	.16
Cresylic, 97 to 99 p.c.	gal.	.65 @	.70
Muriatic, 20 dgrees	cwt.	1.40 @	1.75
Nitric, 36 dgrees	cwt.	5.00 @	6.00
Sulphuric, 66 degrees	ton	16.00 @	17.00
60 degrees, bulk	ton	10.50 @	11.00
Tartaric, crystals	lb.	.30 @	—

Alkalies

Caustic soda, 76 p.c.	cwt.	3.60 @	3.75
Soda ash, 58 p.c.	cwt.	1.85 @	1.90

Oils

Castor, No. 3, bbls.	lb.	.10½ @	—
Corn, crude, bbls.	lb.	.08½ @	.08¾
refined	lb.	.10¼ @	.11
Chinawood, bbls.	lb.	.13½ @	.14
Cottonseed,	lb.	.10 @	—
Glycerine, c.p. drums	lb.	.14½ @	.15
Linseed, domestic	lb.	.74 @	—
imported	lb.	.63 @	—
Palm, Niger	lb.	.06¼ @	.06½
Lagos	lb.	.07¾ @	.08
Peanut, domestic, crude	lb.	.09¼ @	.09½
Pine, steam distilled over 930° sp. gr.	gal.	1.20 @	1.30
Rapeseed, refined	gal.	.82 @	.84
blown	gal.	.93 @	.95
Rosin, first rectified	gal.	.37 @	—
second rectified	gal.	.39 @	—
Tar, commercial	gal.	.31½ @	—
Soya Bean, crude, bbls.	lb.	.08¾ @	.09

Resins and Pitches

Cumar resin, hard	lb.	.09 @	.12
Cumar resin, soft	lb.	.09 @	.12
Tar, retort	bbl.	9.00 @	—
kiln burned	bbl.	10.00 @	—
Pitch, Burgundy	lb.	.05 @	.06
coal tar	ton	01½ @	—
pine tar		03½ @	—
Rosin, grade K	bbl.	6.75 @	—
Strained	bbl.	6.00 @	—
Shellac, fine orange	lb.	.80 @	—

Solvents

Acetone, drums, c.p.	lb.	.12½ @	.13
Alcohol, denatured, No. 1	gal.	.42 @	.44
Methyl, 95 per cent, drums	gal.	.72 @	—
Ethyl, 190 proof, bbls.	gal.	4.70 @	4.80
Benzol, 90 per cent	lb.	.27 @	.33
pure	lb.	.29 @	.35
Carbon bisulphide,	lb.	.06 @	.07
terachloride	lb.	.12 @	—
Dimethylaniline	lb.	.38 @	.45
Naptha, motor gasoline, steel bbls.	gal.	.25 @	—
Toluol, pure	gal.	.30 @	.36
Turpentine, spirits	gal.	.93 @	—
wood	gal.	.90 @	—
Xylol, pure	gal.	.45 @	.51
commercial	gal.	.31 @	.38

Waxes

Beeswax white, pure	lb.	.35 @	.45
Caranuba, No. 1	lb.	.45 @	.46
Ceresin, white	lb.	.07½ @	.10
Bayberry	lb.	.20 @	.22
Montan, crude	lb.	.04½ @	.05
Ozokerite, hard, pure,	lb.	.25 @	—
Parafine	lb.	.02½ @	—
Petrolatum, amber, bbls.	lb.	.05¼ @	.05½
dark amber,	lb.	.04½ @	—

SUBSTITUTES

Black	lb.	.07 @	.14
White	lb.	.08 @	.16
Brown	lb.	.07 @	.14
Brown factice	lb.	.08¼ @	.15½
White factice	lb.	.09 @	.16½

VULCANIZING INGREDIENTS

Lead, black hyposulphite (black hypo)	lb.	.30 @	.42
Orange mineral, domestic	lb.	.11 @	.13
Sulphur chloride (jugs)	lb.	.20 @	—
Sulphur flour	cwt.	1.45 @	2.10
Bergenport (c.l.)	cwt.	2.55 @	—
light, 100 p.c. pure	cwt.	2.60 @	3.15
superfine, 99½ p.c.	cwt.	2.40 @	2.90

Caustic Soda—As with soda ash trading in this material was good but the demand did not extend beyond small quantities. Standard brands on spot could be had at $3.60 at $3.75 per hundred pounds.

Lithopone—The demand for lithopone during January was better than usual at this season of the year. There is every evidence that the demand will increase the coming months and producers expect a busy season for the domestic article. Stocks in first hands are not large. Domestic producers did not change their price schedule and quotations continue at 6 cents per pound in bags; 6¼ cents in barrels, car lots; 6½ cents in barrels less than car lots. Imported material continues to come in but consumers do not find it very satisfactory.

Litharge—Demand light and business slow. There has been no change during the period under review. Late quotations show 7½ at 7¾ cents per pound in casks; in 100 pound kegs, less than 500 pounds, 12.25 cents; 500 to 2,000 pounds 11.02 cents.

Zinc Oxide—There has been a very good demand for zinc oxide, much better than is usual at this season of the year. Producers expect a large spring demand and the market continues on a firm basis. Prices continue the same and there is no probability of any lowered price changes at this time.

Blanc Fixe—Producers and dealers look for a very active market in the near future. At the present time the demand is good and the whole tone of the market strong. Prices remain at 4 @ 4½ cents per pound for dry and $40.00 to $50.00 per ton for pulp.

Barytes—There was a good demand for barytes and more interest manifested than for sometime past. The new price for Western material which is $23.00 package included (which makes the price practically $2.00 a ton under the old price) is said to be less than the price at which the imported article can be delivered.

Talc—Prices remained unchanged with a good demand in evidence for all grades. Domestic was quoted at $18.00 @ $20.00 per ton; high grade French, $40.00 @ $45.00; low grade French, $22.50 at $30.00; Italian, $47.00 at $55.00.

Orange Mineral—Prices for both domestic and imported remained unchanged. Domestic, 11 at 13 cents per pound; German, 14 cents; French, 15 cents.

Whiting—Demand and offerings keep about even with prices unchanged. Commercial, $1.15 per 100 pounds; American Paris white (American) $1.35 at $1.45; English cliffstone, $1.75 at $2.00; gilder's bolted, $1.30 at $1.40.

Toluol—Prices were strong with the demand good in a market where producers were finding it difficult to meet orders for prompt delivery. Quotations ranged from 30 cents to 36 cents per gallon for pure material.

Benzol—Producers are kept busy making deliveries on contracts and have been in no position to accept any new business for prompt delivery. Pure continued at 29 at 35 cents per gallon and 90 per cent at 27 at 33 cents.

Aniline Oil—The market is fairly steady at lower prices. Producers that had been carrying heavy stocks deemed it expedient to move their holdings, and sales in tank cars were reported at 16½ cents per pound f.o.b. works; spot goods around 17 at 18 cents.

Soda Ash—There has been a good demand but orders generally have not been large. Sales were made of light ash in bags in car lots on spot at $1.85 at $1.90 per hundred pounds. Imported material was available at $1.60.

Crude Rubber

February 3, 1922

The course of the crude rubber market during the past fortnight has been in general downward, and during this period prices have fallen about 2 cents per pound on most standard grades. This downward movement has brought about considerable liquidation in stocks in both London and New York. Evidently this liquidation has resulted in some of the off grades like the amber crepes being held at a slight premium. It is also reported that the Singapore Chamber of Commerce Rubber Association has eliminated its A (or No. 1) grade and that the grade formerly known as B (or No. 2) will now be A grade. It is further said that the best amber will in the future be classed as a low grade smoked sheets.

The only reasons assigned for the continued depression in prices are a lack of any active buying interest on the part of the manufacturers and an apparent oversupply of rubber.

Reliable market interests report advices from Singapore to the effect that the rubber planters have not restricted their production to anything like the extent that will be necessary if the present stocks are to be reduced. They claim that the only remedy for present conditions will be far-reaching curtailment of production, and they point to the failures of the planters to meet the recommendations of the Rubber Growers' Association of London in this respect.

The London market on this date was 8½ d equal to 15¼ cents, or about one cent under the New York market. On the other hand the Singapore market and the Colombo market were at 17 cents, almost a cent above the New York market. These inequalities make the transaction of business difficult.

In spite of what is actually going on market prophets say 20 cent rubber will be back again by March.

Quotations on the various grades on this date are as follows:

Plantations			
Ribbed Smoked Sheets spot	.16	@	.16¼
March	.16¼	@	.16½
April/June	.16¾	@	.17
July/September	.17½	@	.17¾
July/December	.18	@	.18¼
October/December	.18¾	@	.19
Smoked sheets plain, spot	.14	@	.14¼
First Latex Pale Crepe, spot	.16	@	.16¼
March	.16¼	@	.16½
April/June	.16¾	@	.17
July/Sept.	.17½	@	.17¾
July/Dec.	.18	@	.18¼
October/December	.18¾	@	.19
Amber Crepe No. 1	.15¾	@	.16
" " " 2	.15¼	@	.15½
" " " 3	.14¾	@	.15
Grand Central Crepe	.15¼	@	.15½
Light clean Thin Brown Crepe	.14¾	@	.15
Clean Thin Brown	.14¼	@	.14½
Commercially Clean thin Brown Crepe	.13½	@	.13¾
Rolled Brown Crepe	.13½	@	.14
April/June	.14¾	@	.15
Paras			
Madeira Fine	.19	@	.19½
Acre Fine	.17½	@	.17¾
Up-river Fine	.17¼	@	.17½
Up-river Medium	.15¾	@	.16
Up-river Caucho ball	.11½	@	.12
Up-river Coarse	.11¾	@	.12
Islands Fine	.16	@	.16¼
Islands, Medium	.15	@	.15¼
Islands Coarse	.09½	@	.10
Cameta	.08¾	@	.09
Xingu Ball	.11	@	.11¼
Tapajos fine, spot	.17¼	@	.17½
Pontianac			
Prime Pressed	.13	@	.13½
Plantation	—	@	.07½
Bangermassin	.08	@	.08¼
Palembang	.10	@	.10¼
Siak Gutta Percha	.18¾	@	.19
Prime Macassar	2.75	@	2.85
Balata			
Panama Block	.30	@	.40
Surinam Sheets	—	@	.67
Columbia Block	.42	@	.43
Venezuela Block	.54	@	.55

Reclaimed Rubber

New York, Feb. 3, 1922

The fall in crude rubber prices has had a somewhat depressing effect on the reclaiming business, but some sizable orders were reported notwithstanding.

Quotations are nominally as follows.

Standard Reclaims			
Floating	$.12	@	$.13
Friction	.12	@	.13
Boots and Shoes	.10	@	.10½
Boots and Shoes (washed)	.13	@	.14
Mechanical	.08	@	.10
Hose	.10½	@	.11½
Tires, truck	.08	@	.09
Tires, auto	.09	@	.10
White	.13	@	.14

Scrap Rubber

New York, February 3, 1922

The market is still quiet; the prices of many grades remain unchanged. The activity enjoyed at the beginning of the year has given place to lassitude on the part of reclaimers. The drop in price of crude rubber is, of course, the explanation for this. Although inquiries about boots and shoes are being received by many scrap rubber dealers, little demand has been reported, due, probably to the high prices of this grade in comparison with the others.

Quotations are nominally as follows:

Auto tire peelings	.01¼	@	.01¼
Standard White auto	.01½	@	.01¼
Mixed auto	.00¾	@	.00⅞
Bicycle tires	.00½	@	.00⅝
Solid truck tires	.00¾	@	.01
Boots and shoes	.02⅞	@	.03
Arctics, trimmed	.02	@	.02¼
Arctics, untrimmed	.02	@	.02½
Inner tubes, No. 1	.03½	@	.03½
Inner tubes, compounded	.02½	@	.02⅝
Battery jars, black compounded	Nominal		
Battery jars No. 1 bright fracture	Nominal		
Inner tubes, red	.02½	@	.02⅝
Heels and pads	Nominal		
Black mixed	.00½	@	.00¾
Garden hose	.00½	@	.00⅝
Air brake hose	.00½	@	.00¾
Red packing	.01	@	.01¼
Red mixed rubber	.01¾	@	.02
White mixed rubber	.01¾	@	.02

American Rubber Patents

1,400,934—To David R. Brown and Carl F. Schnuck, Ansonia, Conn., assignors to Farrel Foundry & Machine Co., Ansonia, Conn. Machine for treating rubber and similar material.

1,400,618—To William M. Mackintosh, Springfield, township, Summit County, Ohio, assignor to The Kelly-Springfield Tire Co., Akron, O. Method of vulcanizing rubber.

1,401,045—To William L. Clendenning, Philadelphia, Pa., assignor of one-half to Rosena Kelly-Walker, Wildwood, N. J. Tire.

1,401,061—To Samuel J. Flynn, Portsmouth, Va. Armored Tire.

1,400,915—To Julius Hugo Skogman, Joplin, Mo. Emergency-Tire For Automobiles.

1,402,472—To Ernest H. Benedick, Huntington, W. Va., assignor of one-third to Ira J. McGinnis and one-third to Ernest E. Kincade, Huntington, W. Va. Lock For Spare Rims and Tires.

1,402,160—To Joseph S. Gwozdz, Chicopee Falls, Mass., assignor to Simplex Rubber Co., Boston, Mass. Rubber Heel.

1,402,492—To Walther H. Grote, Louisville, Ky., assignors to Associated Holdings Corporation, New York, N. Y. Process of Splicing The Ends of Rubber Tubes.

1,402,190—To Benjamin C. Swinhart, Akron, Ohio. Cushion Tire.

1,402,471—To Andrew F. Beck, Manitowoc, Wis. Tire and Rim Manipulating Appliance.

1,402,212—To Warren Collins, Fort Worth, Tex. Resilient Tire Filler.

1,402,447—To William Huntington Russell, New Haven, Conn. Combination Tire Holder and Extricator.

1,401,948—To John M. Abrams, Brooklyn, New York. Resilient Tire.

1,402,359—To Hans A. Hille, Oskaloosa, Iowa, Resilient Tire.

1,402,624—To Chris H. Lambert, Cincinnati, O., assignor to Hercules Rubber Corp., Cincinnati, O. Resilient Tire.

1,402,628—To John D. McGrath and Charles H. McCarthy, New York, N. Y. Resilient Tire.

1,402,003—To Philip M. Miller, Brooklyn, New York. Vehicle-Wheel Pneumatic Tire Rim.

Trade Marks Applied For

[The following are trade-mark applications pertinent to our field pending in the United States Patent Office which have been passed for publication and are in line for early registration unless opposition is filed promptly. For further information address National Trade-Mark Company, Barrister Building, Washington, D. C. or Bush Building, 130 West 42 Street, New York, trade-mark specialists. As an additional service feature to its readers this Journal gladly offers to them an advance search free of charge on any mark they may contemplate adopting or registering.]

A BEAR FOR WEAR below picture of white bear standing in a tire—No. 136,796. Gillette Rubber Company, Eau Claire, Wis. For Rubber Vehicle Tires and Rubber Tire Treads.

A W C Crossed by central band with name American Wholesale Corporation—No. 136,053. American Wholesale Corporation (Baltimore Bargain House) Baltimore and Cumberland, Md. For Lead Pencils, Colored Pencils, Notebooks, Ledgers, Pen Points, Stylographic Pens, Penholders, Paper Weights, Paper Files and Binders, Mailing Envelopes, Writing Papers, Ink and Pencil Erasers of Rubber and Rubber Composition, Crayons, Fountain Pens, Blotters, Rulers for School and Desk Use, Pencil Sharpeners, Desk Pads, Toilet Paper, Wrapping Paper, Thumb Tacks, Paper Fasteners, Writing Tablets, Inkwells and Letter Openers.

DOROTHY JUNIOR—No. 155,600. Dorothy Dodd Shoe Company, Boston, Mass. For Men's, Women's and Children's Boots, Shoes and Slippers of Leather, Rubber, Felt, Silk, Cloth or other Fabric Construction.

DIAL across a watch dial—No. 155,597. Churchill & Alden Co., Brockton, Mass. For Shoes and Boots of Leather, Canvas, Woolen Cloth, Rubber, Panama Straw, and other Fabrics for Men, Women and Children.

PRESIDENT—No. 155,364. Phillips' Patents, Limited, London, England. For India-Rubber Plates, Pads, and Pieces for Attachment to the Soles or Heels or Both Soles and Heels of Boots and Shoes.

GOLO—No. 151,086. Golo Slipper Company, New York, N. Y. For Footwear—viz., Shoes, Slippers and Sandals Made of Leather, Fabric and Combinations of Leather, Fabric and Rubber.

THE EDWIN CLAPP SHOE within oval with picture of kangaroo and crown—No. 150,888. Edwin Clapp & Son, Inc., East Weymouth, Mass. For Shoes of Leather, Rubber, Fabric and Combinations Thereof.

New Incorporations

NEW YORK

Johnstone Tire Co., to manufacture tires. $250,000. Agent: U. S. Corporation Co., New York.

Five Corners Auto Supply Corporation, to deal in tires. $5,000. Incorporators: E. A. and H. H. Spiegel; W. N. Kirk. Attorneys: A. N. and H. R. Johnson, Freeport, New York. Principal office, Freeport, New York.

Economy Patches Co., to manufacture rubber goods. $25,000. Incorporators: O. Brown, 1170 Clay avenue; D. J. Murphy, 303 W. 114th street; J. M. Murphy, 321 West 48th street—all in New York City.

CONNECTICUT

Blue Ribbon Tire Co., Inc., to sell tires. $15,000. J. P. O'Day, president; F. B. Alling, secretary and treasurer. Principal office, 134 Cannon street, Bridgeport, Connecticut.

DELAWARE

Johnstone Tire Stores Company, to manufacture tires, tubes, etc. $250,000. Principal office, Dover, Delaware.

Goodyear Tire and Rubber Export Co., to deal in rubber goods. $10,000. Incorporators: M. A. Bruce, C. M. Blaske and T. L. Croteau of Wilmington, Delaware. Agent: Corporation Trust Co. of America.

Ajax Tire Co. of Fresno, to sell in and about Fresno the products of the Ajax Rubber Co. Inc. $8,000. T. W. Dwyer, president, general manager and treasurer, 530 Golden Gate avenue, San Francisco; W. J. Jackson, secretary. Delaware agent, Corporation Trust Co. of America, Wilmington, Delaware. Principal office, 220 West 57th street, New York, N. Y.

Hill Rubber Co., to manufacture and deal in tires. $25,000. Incorporators: F. R. Hansell and J. V. Pimm of Philadelphia; E. M. McFarland of Camden, New Jersey. Agent: Corporation Guarantee and Trust Co., Wilmington, Delaware.

Batavia Tire and Service Co., to deal in tires and tubes. $500,000. Incorporators: R. T. Moniz, 690 Highland avenue, Peekskill; E. M. Fraser, Meadowbrook—both in New York; T. D. Dunville, 44 Beach Road, Ridgewood, New Jersey. Delaware agent, Delaware Registration Trust Co., 100 West 10th street, Wilmington, Delaware.

FLORIDA

Aero Cushion Inner Tire Co., to make and sell rubber products. $50,000. J. A. Cox, president; E. W. Evans, vice president; W. I. Evans, secretary—all of St. Petersburg, Florida. Principal office, St. Petersburg, Florida.

The Devane S. Doyle Co., to deal in tires. $25,000. D. S. Doyle, president, Tampa; H. Shepard, vice president, Jacksonville; C. F. Shepard, secretary, Tampa—all in Florida. Principal office, Tampa, Florida.

Cuba Tire Corporation, to buy, sell and deal in automobile tires. W. T. Carter; president; H. A. Phillips, vice president; K. P. Carter, secretary—all of Miami, Florida. Principal office, Miami, Florida.

INDIANA

Universal Tire and Rubber Co., to manufacture tires and rubber goods. $10,000. Directors: C. L. Smith, J. J. Detzler, J. U. Tilman, W. S. Tilman and A. J. Tilman. Principal office, Michigan City, Indiana.

KENTUCKY

Fayette Tire Co., to deal in tires. $10,000. Incorporators: W. R. McConnell, J. M. Kash, and E. Adams—all of Lexington, Kentucky. Principal office, Lexington, Kentucky.

Kentucky Non-Deflating Tube Co., to sell and repair tubes, tires etc. $25,000. Incorporators: D. H. Hopkins, H. J. Carey, R. J. Griffith—all of Darves, West Virginia. Principal office, Ashland, Kentucky.

McClintock Tire Co., to deal in rubber tires and tubes. $5,000. Incorporators: J. L. Thompson, W. C. Walsh, L. M. Scott. Principal office, Lexington, Kentucky.

MAINE

United Rubber Corporation. Stock, 1000 shares, no par value. Edgar I. Warren, president and treasurer; clerk, Doris Irene Laffin—both of Portland, Maine. Directors: Edgar J. Warren, Laurence L. Murray and E. E. Thompson—all of Portland, Maine.

MASSACHUSETTS

Plymouth Rubber Company, to manufacture and deal in tires. $150,000. Principal office, Canton, Massachusetts. Incorporators: Maurice J. Hamilburg and Mez E. Bernkhof of Boston and Reuben B. Gryzmish of Brookline.

Phenix Rubber Co., to manufacture rubber heels and other rubber products. $25,000. Incorporators: Charles D. Burnes of Brookline and Charles D. Wener and Lena H. Wener of Brockton.

Johnson-Martin Co., to manufacture and deal in rubber goods. $100,000. W. N. Johnson, president and assistant treasurer of Arlington, New Jersey; H. J. Martin, vice president and treasurer, Brookline; W. L. Allen, clerk, 209 Washington street, Boston. Principal office, Brookline, Massachusetts.

The Lapworth Webbing Co., to manufacture and deal in rubber goods. $300,000. Incorporators: C. A., W. W., M. and C. N. Lapworth—all of Howard Street, West Bridgewater, Massachusetts.

Metropolitan Air Goods Co., to manufacture pneumatic rubber goods. $200,000. L. S. Starrett, president; R. A. Whall, general manager and treasurer. Principal office, Athol, Massachusetts.

MINNESOTA

The Leats Tire & Rubber Co., to manufacture tires. $10,000. Incorporators: W. A. Sabin, J. M. Lamont and L. A. Mitchell. Principal office, Duluth, Minnesota.

MISSOURI

Inner Guard Tube and Rubber Co., to manufature tubes. $300,000. L. Goodhart, president, L. Burnham, vice president; J. H. Heitman, secretary; I. Hafz, treasurer.

Progressive Rubber Co., to manufacture hot and cold water bottles, ice bags etc. $10,000. Incorporators: C. M. Kelly, L. V. Rose, S. T. Cooper—all of St. Louis.

NORTH CAROLINA

National Manufacturing and Sales Co., Inc., to manufacture and sell material for tires and tubes. $25,000. O. C. Klingman, president; R. M. Middleton, vice president; E. C. Klingman, secretary and treasurer. Principal office, 315 West Market street, Greensboro, North Carolina.

OHIO

The Miller Rubber Glove Co. $1,000. Incorporators: Charles R. Wetzel and E. A. Hollinger, W. M. Renick, W. H. Hachett and W. M. Owsley. Principal office, Columbus, Ohio.

Akron Tire Display Co. $10,000. Incorporators: M. S. Sloman and R. J. Hough. Principal office, Cuyahoga Falls, Ohio.

Double Mileage Tire and Rim Co. $500. Incorporators: William O'Connell and Harry A. Phillips of Cincinatti, Ohio. Principal office, Cincinnati, Ohio.

Crown Rubber Products Co., to manufacture and deal in rubber products. $10,000. Incorporators: H. F. Rolf, J. F. Carpenter, H. B. Hoener, R. A. Graham and E. V. Dike—all of Cleveland, Ohio. Principal office, Cleveland, Ohio.

K. and F. Heel Co., to manufacture rubber heels. $150,000. Incorporators: J. C. Krieg, F. Fishbough, P. E. Taylor, G. W. Stewart and F. Stone. Principal office, Newark, Ohio.

PENNSYLVANIA

D. J. H. Rubber Products, Inc., to deal in crude, refined and manufactured rubber. $80,000. Incorporators: David Cohen, John M. Hemphill and Harold Cohen—all of Philadelphia. Principal office, Philadelphia.

SOUTH CAROLINA

The Holley Buick Co., to deal in tires, etc. $10,000. J. M. Holley, president; I. R. Woodward, treasurer—both of Aiken, South Carolina. Principal office, Aiken, South Carolina.

James F. Liles, Inc., to deal in tires, etc. $10,000. J. F. Liles, president and treasurer; G. G. Liles, secretary. Principal office, 115 Marlboro street, Bennettsville, South Carolina.

TENNESSEE

Dixie Rubber Co., to deal in rubber goods. $250,000. Principal office, Memphis, Tennessee; branch office, Miami, Florida.

TEXAS

United and Globe Rubber Co. of Texas, to deal in rubber products. Incorporators: R. H. Moers, K. C. Barkley and H. B. Schlesinger. Principal office, Houston, Texas.

THE RUBBER AGE BUYERS GUIDE

ACCELERATORS
States Metals Co., Inc., New York.
Wishnick-Tumpeer Chemical Co., Chicago.

ACCUMULATORS
Adamson Machine Co Akron, O.
Akron Rubber Mold & Machine Co., Akron, O.
Allen Machine Co., Erie, Pa.
Birmingham Iron Foundry, Derby, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Wellman - Seaver - Morgan Co., Cleveland, Ohio.

ACIDS
Harshaw, Fuller & Goodwin Co., Cleveland, O.
National Aniline & Chemical Co., Inc., New York.
Wishnick-Tumpeer Chemical Co., Chicago.

ACID TANKS
Birmingham Iron Foundry, Derby, Conn.
Devine, J. P., Co., Buffalo, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.

AIR & STEAM METAL BAGS
Allsteel Ridewell Tire & Rubber Co., Dayton, Ohio.

AIR BRAKE HOSE
United States Rubber Co., New York.

AIR GOODS
Davol Rubber Co., Providence, R. I.
Hodgman Rubber Co., Tuckahoe, N. Y.
United States Rubber Co., New York.

AIR MATTRESSES
Davol Rubber Co., Providence, R. I.
Hodgman Rubber Co., Tuckahoe, N. Y.
United States Rubber Co., New York.

AIRPLANE AND BALLOON CLOTHS
United States Rubber Co., New York.
Hodgman Rubber Co., Tuckahoe, N. Y.

ALBA WHITING
Daigger, A., & Co., Chicago, Ill.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Industrial Chemical Co., New York.
Wishnick-Tumpeer Chemical Co., Chicago.

ALCOHOL
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Tyler Patterson Co., Clev'd, O.
Wishnick-Tumpeer Chemical Co., Chicago.

ALUMINUM FILLER
Wishnick-Tumpeer Chemical Co., Chicago.

ALUMINUM FLAKE
Aluminum Flake Co., Akron, Ohio.
Butcher, L. H., Co., New York.
Fulper, Edward B., Trenton, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.

AMMONIA AQUA
Laidlow, Kelly & Co., New York.
Tyler Patterson Co., Clev'd, O.
Wishnick-Tumpeer Chemical Co., Chicago.

ANGLE THERMOMETERS
Taylor Instrument Companies, Rochester, N. Y.

ANILINE OIL
Butcher, L. H., Co., New York.
Daigger, A., & Co., Chicago, Ill.
Fulper, Edward B., Trenton, N. J.
Klipstein, A., & Co., New York.
National Aniline & Chemical Co., Inc., New York.
Tyler Patterson Co., Clev'd, O.
Wishnick-Tumpeer Chemical Co., Chicago.

ANILINE OIL PLANTS
Devine, J. P., Co., Buffalo, N. Y.

ANTIMONY, SULPHURETS
Butcher, L. H., Co., New York.
Daigger, A., & Co., Chicago, Ill.
Fulper, Edward B., Trenton, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
States Metals Co., Inc., New York.
Rare Metal Products Co., Belleville, N. J.
Tyler Patterson Co., Clev'd, O.
Typke & King, Mitcham, England.
Wishnick-Tumpeer Chemical Co., Chicago.

APRONS—RUBBER
Hodgman Rubber Co., Tuckahoe, N. Y.
Miller Rubber Co., Akron, Ohio.

ARTIFICIAL RUBBER
Carter Bell Mfg. Co., New York.
Stamford Rubber Supply Co., Stamford, Conn.

ASBESTINE
Butcher, L. H., Co., New York.
Daigger, A., & Co., Chicago, Ill.
Fulper, Edward B., Trenton, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Tyler Patterson Co., Clev'd, O.
Wishnick-Tumpeer Chemical Co., Chicago.

ATOMIZERS
The Rubber Products Co., Barberton, Ohio.

AUTOCLAVES
Devine, J. P., Co., Buffalo, N. Y.

AUTOMOBILE COATS
Hodgman Rubber Co., Tuckahoe, N. Y.
United States Rubber Co., New York.

AUTO TOP FABRICS
Hodgman Rubber Co., Tuckahoe, N. Y.
Taylor, Armitage & Eagles, Inc., New York.
Turner Co., J. Spencer, New York.
United States Rubber Co., New York.

BALATA
Wood, Charles E., New York.

BALATA FILM (Colorless)
Peters Bros. Rubber Co., N. Y.

BALLOON FABRICS
United States Rubber Co., New York.

BALLOONS, TOY
Miller Rubber Co., Akron, Ohio.

BALLOONS, TOY, DYES FOR
National Aniline & Chemical Co., Inc., New York.

BALLS, DOLLS AND TOYS
Davol Rubber Co., Providence, R. I.
Essex Rubber Co., Trenton, N. J.
Miller Rubber Co., Akron, Ohio.

TIRE
FABRICS

JENCKES
SPINNING
COMPANY

PAWTUCKET
RHODE ISLAND

AKRON OFFICE
Second National Building

NEW YORK OFFICE
Fisk Building
Broadway at 57th St.

R.S.L. PRODUCTS

HARDWOOD PITCH
"The" Rubber Flux,

ALUMINUM FLAKE
A quality clay,

THIOCARBANILIDE
METHYLENE-ANILINE
ETHYLIDENE-ANILINE

Consultation on our products is yours for the asking

The
RUBBER SERVICE LABORATORIES
Company

220 Medford Bldg. AKRON, OHIO